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LA, PS and FLA analysed the initial Ukraine datasets. PV, NM, JS, FLA, and EBP performed the modelling and were responsible for initial and final drafts of the modelling sections and the development of figures.

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Abstract

Despite global reductions in HIV incidence and mortality, the 15 countries of Eastern Europe and Central Asia (EECA) that gained independence from the Soviet Union in 1991 is the only region where both continue to rise. HIV transmission in EECA is fueled primarily by injection of opioids, with harsh criminalization of drug use that has resulted in extraordinarily high levels of incarceration. Consequently, people who inject drugs (PWID), including people with HIV, HCV and tuberculosis, are concentrated within prisons. Evidence-based primary and secondary HIV prevention using opioid agonist therapies (OAT) like methadone and buprenorphine maintenance therapies and needle/syringe programs (NSP) are available in five and three EECA countries, respectively, with none of them meeting recommended coverage levels. Similarly, antiretroviral therapy (ART) coverage, especially among PWID, is markedly under-scaled. Russia bans OAT and does not support NSP—with neither available in prisons—despite the country's high incarceration rate and numbers of PWID and people living with HIV (PLH). Mathematical modelling for Ukraine suggests that high levels of incarceration in EECA countries enhances HIV transmission among PWID, with 28% to 55% of all new HIV infections over the next 15 years being attributable to heightened HIV transmission risk among currently and/or previously incarcerated PWID. Additional analyses also indicate that at least 6% of all incident TB cases and 75% of incident TB cases in PWID are due to incarceration. Interventions that reduce incarceration itself and effectively intervene with prisoners to screen, diagnose and treat addiction and HIV, HCV and tuberculosis are urgently needed to stem the multiple overlapping epidemics concentrated in prisons.

Key Messages

- Incarceration rates in Eastern Europe and Central Asia are among the highest in the world due to policies that concentrate people who use drugs and others at high risk for HIV, viral hepatitis and tuberculosis.

- Due to policies within this region, the prevalence of HIV, HCV and tuberculosis infection is several-fold higher than in the surrounding community.

- Analyses from Ukraine suggest that incarceration could be contributing up to half of all new HIV infections among people who inject drugs, and scaling up opioid agonist therapy within prisons and effectively transitioning them to the community would markedly reduce HIV transmission within this group.

- Similarly, strategies that reduce incarceration of people who inject drugs in Ukraine would greatly reduce the number of new tuberculosis cases, underscoring the importance of screening, treatment and continuity of care for prisoners with or at risk for tuberculosis.

- Armenia, Kyrgyzstan and Moldova have successfully introduced all 15 of the internationally-recommended HIV prevention strategies, including provision of opioid agonist therapy with methadone and needle and syringe programs – albeit inadequately scaled-to-need.

Introduction

The negative and mutually reinforcing nature of incarceration, substance use disorders (SUDs), blood-borne viruses like HIV and HCV, and tuberculosis (TB) is especially problematic in the 15 UNAIDS-designated countries of Eastern Europe and Central Asia (EECA) and results in a concentration and deleterious interaction between these co-morbid health and social conditions.[1,2] EECA is now the only region where the number of new HIV infections have increased annually from 120,000 to 190,000 between 2010 and 2015, resulting in the number of people with HIV (PLH) increasing from 1.0 to 1.5 million.[3] While new World Health Organization (WHO) guidelines recommend treatment for all PLH irrespective of CD4 count, coverage with antiretroviral therapy (ART) in the region is <10%[4] and occurs with suboptimal screening for diseases and suboptimal coverage of evidence-based HIV prevention strategies like opioid agonist therapies (OAT) with methadone or buprenorphine and needle/syringe programs (NSP).[5,6]

In EECA, proscriptive policies that promote arrest of socially vulnerable individuals at increased risk for HIV, viral hepatitis and TB, like people who inject drugs (PWID), men-who-have-sex with men (MSM) and sex workers, result in a concentration of risk within prisons, which amplifies disease and leads to onward infection in the community post-release.[7] These epidemics converge in the EECA region, where abrupt and far-reaching social, economic and political transitions since the dissolution of the Soviet Union in 1991 have resulted in poor public health consequences. Where such negatively reinforcing comorbidities exist, effective HIV prevention and treatment must address all problems simultaneously to have a noticeable impact.[1] Yet, the HIV

response remains inadequate as HIV incidence and mortality continue to increase in EECA, despite a reduction worldwide.[3]

Although EECA countries are culturally and religiously distinct and underwent different political, economic and social trajectories since independence, they share socio-political, philosophical and organizational vestiges of the former Soviet Union, which now shape the evolving syndemics of mass incarceration, SUDs, HIV, HCV and TB. Aside from the high-income countries of Estonia, Lithuania and Latvia, the 12 other EECA countries are low/middle-income countries (LMIC). Following the Soviet Union's collapse, in this setting of political and economic instability, heroin entered through new trade routes from Afghanistan.[8,9] Injected heroin increased and led to explosive HIV transmission among PWID, where the epidemic remains mostly concentrated today. Harsh drug policies and criminalization laws ensued targeting PWID, with resultant mass incarceration, prison overcrowding[10] and high incarceration rates (five of the top 10 globally).[11] The concentration of PWID, PLH with compromised immune systems and individuals with TB in criminal justice systems (CJS) created especially high-risk environments for HIV and TB transmission.[12-14] The crumbling health infrastructure, unaccustomed to implementing HIV and TB prevention and treatment in prison settings, disregarded human rights recommendations.

Data have not been comprehensively synthesized, however, to understand how the CJS contributes to the expanding HIV and related epidemics in EECA. Here, we describe how incarceration, HIV, HCV, TB and SUDs converge to produce drug-related harm by applying the *risk environment* framework.[15] Our analyses aim to understand how individual HIV-risk behaviours are embedded in social processes using the *risk*

environment framework, specifically, incarceration within EECA.[15,16] Further, mathematical modelling and statistical analyses are used to assess the degree to which incarceration contributes to HIV and TB transmission among PWID in Ukraine and assesses the effectiveness of evidence-based HIV prevention strategies in reducing the harms of incarceration.

METHODS

[INSERT THIS NEAR HERE WITHIN THE METHODS SECTION]

Comprehensive Review Search Strategy
We conducted a comprehensive review of peer-reviewed publications and reports related to addiction, HIV, HCV, and TB treatment and prevention in CJS in the 15 countries of EECA (Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan). Key words and MeSH Headings related to incarceration (i.e., "inmate," "prison," "prisoner," "detainee," "criminal justice," "pre-trial," "detention," "jail," "SIZO," "correctional,") were cross-referenced with citations pertaining to each of the focus infectious diseases ("HIV", "AIDS", "HCV", "tuberculosis") or SUDs ("heroin," "opioids, "drug use", "methadone", "buprenorphine", "substance ab/use," "addiction"). We limited our search to articles that were published in English and Russian on PubMed and Google Scholar between January 1, 2012 and July 20, 2015. We retrieved and reviewed 1,837 unique citations, and 449 where selected for inclusion. Additional information from other sources was also included. We reviewed grey literature from websites in English, Ukrainian and Russian, including government-reported health status of prisoners in each country.

Analytical Framework

The aims of this comprehensive review are to: 1) review the historical features occurring during a devastating transitional period that shape the concurrent epidemics; 2) present a theoretical framework for understanding how the CJS, including policing and incarceration practices, influences the evolving HIV and TB epidemics; 3) provide an analysis of up-to-date legal, criminal justice and epidemiological data from EECA countries; 4) use detailed data from Ukraine to estimate the degree to which

incarceration contributes to HIV transmission among PWID (using dynamic mathematical modelling) and TB transmission among PWID and the general population (using statistical analyses); and 5) recommend directions for future prevention, treatment and research.

Here, we examine how the risk environment within the CJS mutually reinforces and concentrates the effect of several medical conditions (e.g., HIV, HCV, TB) in the CJS. This is impacted by at least one social condition (e.g., incarceration) but also includes the policing practices that influence arrest and entry into the CJS and the experiences within the CJS environment itself, which result in the syndemic of social and medical co-morbidities. The amplification of drug-related harm in prisons[17-19] is best understood using the conceptual framework of the *risk environment* framework.[15] This framework posits that individual decisions about disease prevention and treatment are rooted in structural risk such as spaces (in this case, prisons) that, while exogenous to the individual, independently contribute to risk-taking and health-seeking behaviours. Hierarchical social structures within the CJS, interpersonal violence and the loss of safety, stigma, privacy and autonomy often limit decision-making by prisoners', including choices about healthcare engagement and drug use.[16,20] Access to prison-based HIV and other healthcare (like OAT) services, and the capacity to reduce drug-related harm, is influenced by these environmental factors, at the social, economic, and political levels.[21]

Survey Methods

In most EECA countries, access to accurate prison-related data and formal and informal operations of the penitentiary systems is limited. We therefore aimed: 1) to compile data on prisoner health and access to health services focusing on drug-related

and co-morbid conditions; 2) to compile supplemental survey information from prison medical departments with assistance from UNODC using official governmental requests in each country. Among 15 surveys requested, 11 responded and findings are included in **Tables 1** and **2**.

Evaluating the contribution of incarceration to HIV and tuberculosis transmission

We conducted dynamic HIV transmission modelling to assess the long-term contribution of incarceration to HIV transmission among PWID in Ukraine, and assessed the impact of reducing incarceration and scaling-up prison-based OAT. Additional statistical analyses assessing the contribution of incarceration to TB transmission in both PWID and the general population in Ukraine were used to estimate the contribution of current or recent incarceration to yearly TB transmission in these groups. Modelling and epidemiological methods and results are described in the Ukraine Case Study, with further details and model equations included in **Boxes 1 and 2** and the online appendices.

Historical Framework, Organization of Criminal Justice and its Influence on Eastern Europe and Central Asia

Governmental ministries other than the Ministry of Health administratively oversee the CJS in the EECA region, including healthcare delivery, in all EECA countries (**Figure 1** and **Table 2**). Police oversight and arrest, with short-term detention in lock-up facilities, is overseen by the Ministry of Interior. Healthcare in pre-trial detention and prisons, however, fall under a variety of ministries. International organizations, however, support separating oversight of investigations and prosecution from the execution and supervision of criminal sanctions. Importantly, although the

WHO recommends that prisoner healthcare be consistent with community care standards, and overseen by the Ministry of Health,[22] none of the EECA countries have adopted this recommendation. Some countries, however, have created separate ministries devoted specifically to specialized prisoner supervision.

The CJS in all EECA countries, derived from the Soviet system, includes pre-trial detention centres, similar to jails and referred to as SIZO, where detainees remain for up to two years while awaiting sentencing. After sentencing, treatment is interrupted by transitional supervision for up to 2 months in *etap*, which is overseen by the Ministry of Interior, followed by placement in penal colonies (including lower security 'settlement' colonies and colonies for juvenile offenders) or prisons with cellblocks after sentencing. Each ministry responsible for oversight at various stages within the CJS, however, may have policies that conflict with the other (e.g., regarding allowance or provision of various services). **Table 1** compares the infectious disease prevalence and harm reduction coverage in prisons and communities in each country. **Table 2** and the expanded version in the appendix provide an overview of CJS facilities in each country based on our survey and published reports. Sentenced prisoners are generally divided into minimum, medium and maximum-security facilities, which we term "prisons." Prisoners with HIV are not segregated but those with TB are isolated in dedicated, specialized TB medical wards.

The legacy of Soviet-style addiction treatment, termed narcology,[23] prevails in EECA countries and includes non-evidence-based measures like utilization of antidepressants, anxiolytics, antipsychotics, excessive physical exercise, neurosurgery and kinesio-therapy to treat addiction. In Russia, the only criterion of successful

addiction treatment is *complete abstinence from any psychoactive substance,* including from physician-prescribed methadone and buprenorphine, which are part of the WHO list of essential medications that remain banned throughout the country. These measures follow the Soviet-era models of repressive psychiatry, contrary to international standards, [24] and often amount to suffering, discrimination and humiliation for drug-dependent people (see Panel 2). Prison staff often harbour negative attitudes toward OAT and consider drug dependence a social problem and with resultant criminal behaviour rather than a chronic, recurring illness.[25] Despite elevated HIV within prisons, the legal framework across EECA often falls short of human rights mandates for ensuring access to evidence-based addiction and HIV services within the CJS. OAT with methadone or buprenorphine is internationally-recognized as the most effective treatment for chronic, opioid dependence and is also among the most effective primary and secondary HIV prevention strategies available.[1,26] Moreover, mathematical modelling suggests that OAT expansion is the single most cost-effective means of controlling the HIV epidemic in EECA,[27] but when combined with ART scale-up, it is more effective but also more costly.[28] Regional policies (**Tables 1 and 2**) vary on whether OAT is provided throughout the entire incarceration (Moldova, Armenia and Kyrgyzstan; see Panel 1), upon entry to police-lockup with supervised withdrawal (Georgia, Lithuania, Latvia, Estonia and Ukraine), only in the community (Belarus, Azerbaijan, Tajikistan and Kazakhstan) or not at all (Russia, Uzbekistan and Turkmenistan). Moreover, contradictory legal mandates lead to an uneven distribution of care. In Ukraine, although national drug policies necessitate harm reduction programs (including OAT and NSP) for all PWID, the medical guidelines require current signs of physical

dependence, which are not always evident after a detainee completes withdrawal in police lockup or in SIZO, disqualifying convicted prisoners from treatment.

An Overview of Mass Incarceration, Substance Use Disorders, HIV, HCV and Tuberculosis Infections

Mass incarceration

The dramatic rise and interrelationship between incarceration, HIV, HCV and tuberculosis in EECA is multifactorial.[29-32] The Soviet collapse gave rise to numerous factors that independently and collectively contributed to unprecedented mass incarceration in all EECA, in part, as a result of decreasing industrial output, living standards, and life expectancy.[4] EECA, with 1.1 million prisoners, has some of the highest incarceration rates globally,[11] giving rise to the term "criminological transitions" for EECA countries.[33] Although incarceration rates have decreased modestly over the past decade, thirteen of the fifteen EECA countries still have rates that exceed the world average of 146 prisoners/100,000 population, with ten exceeding 200: Turkmenistan (583), Russia (455), Belarus (335), Lithuania (315), Georgia (281), Kazakhstan (275), Latvia (264), Azerbaijan (236), Estonia (218) and Moldova (212); Ukraine recently plummeted from 324 to 195 due to regional conflicts.[11] This mass incarceration is the result of several intersecting factors, which have converged to result in some of the highest general population prevalences of HIV,[34] HCV[35] and tuberculosis, including multi-drug resistant tuberculosis (MDR-TB),[12] in the world,[29,31] concentrated further within prisons where rates are substantially higher.

Substance use disorders

After 1991, injectable opioid use increased markedly due to changes in drug routes from Afghanistan and economic collapse promoting a new drug economy.[8,36] Consequently, volatile opioid injection and HIV epidemics followed.[10] A number of harsh criminal sanctions toward PWID ensued, resulting in escalating incarceration rates, especially of PWID who either had or were at high risk for HIV. Moreover, with the backdrop of economic instability and low wages for public servants like police, PWID became targets for bribes and other forms of corruption. Inability to pay resulted in arrest, detention, and imprisonment.[37,38] Consequently, PWID represent over one third of prisoners in EECA, but may be as high as 50% to 80% in some EECA countries.[39-42]

Explosive HIV transmission dynamics accompanied the growing number of PWID and incarceration rates in EECA, with HIV incidence and HIV-related mortality remaining volatile and increasing. Although HIV is concentrated among PWID and their sexual partners, there is evidence of transmission among sex workers and MSM.[43] By year-end 2013, there were over 1.4 million PLH in EECA, with over 85% residing in Russia and Ukraine.[44] Despite recent evidence of modestly expanded HIV prevention programs in some EECA countries, coverage with ART (especially among PWID), OAT and NSP remains low.[5,6] Also, extensive migration between and within some EECA countries results in lack of access to HIV prevention on the basis of citizenship or official registration for governmental healthcare.[40,43]

HIV

Prisons present as structural risk environments (**Figure 2**) due to the high concentration of PWID, HIV and HCV.[34] HIV prevalence in prisoners is high throughout

EECA. While no reliable data exist for Turkmenistan and Belarus, HIV prevalence exceeds 10% in four countries - Latvia (20.4%), Ukraine (19.4%), Estonia (14.1%) and Kyrgyzstan – but remains markedly higher than in the community in Uzbekistan (4.7%), Lithuania (4.1%), Kazakhstan (3.9%), Azerbaijan (3.8%), Armenia (2.4%), Tajikistan (2.4%), Moldova (1.9%) and Georgia (0.4%). In nationally representative prison surveillance studies, HIV prevalence is 22-fold, 19-fold, and 34-fold higher in prisons than in surrounding communities in Ukraine,[39,45] Azerbaijan[40] and Kyrgyzstan,[41] respectively. Factors contributing to this concentration include harsh policies and laws toward PWID, police targeting PWID and within prison-drug injection. In Russia, nearly all drug-related convictions are for drug *use* rather than drug *trafficking*.[46]

Estimates of within-prison drug injection range from 3-53%,[17,18,47,48] and have contributed to volatile HIV transmission within prisons in the region,[49] a sobering consequence of the overrepresentation of PWID and untreated SUDs within prison. Evidence suggests that PWID inject less frequently in prisons than outside, but HIV transmission risks are markedly elevated within prisons because injection equipment is scarce with increased high-risk sharing.[18] This may, in part, contribute to findings that prior incarceration is independently associated with HIV among PWID in community settings,[50] which we also found in our Ukraine Case Study (**Figure S9** in online appendix). Moreover, few studies have examined within-prison drug injection in EECA, but data from HIV-infected Ukrainian prisoners showed extraordinarily high levels (54%) with many injection-sharing partners.[17]

HIV treatment is effective HIV prevention and must include prisoners,[51] many of whom are PWID.[52] Achieving UNAIDS 90-90-90 targets requires improved screening,

treatment and adherence outcomes[53] in EECA countries. Despite National AIDS Centres in some countries reporting high ART coverage levels in prisoners who are diagnosed,[42,54] the majority of PLH remain undiagnosed within EECA prisons. Only half of PLH in Ukrainian and Kyrgyz prisons are diagnosed before leaving prison.[39,41,45] In Ukraine, fewer than 12% of PLH were aware of having HIV, with another 40% being diagnosed during incarceration, leaving almost half still not aware of their status.[45] In Azerbaijan, however, HIV diagnosis approaches 75%.[40] While both Azerbaijan and Kyrgyzstan provide high ART coverage for PLH who are diagnosed,[40,41] fewer than 4% of PLH in Ukrainian prisons receive it.[39,45] No EECA country has data for ART coverage post-release, but even data from high-income countries suggest that the transition period from prison is one of heightened vulnerability when ART coverage falls precipitously and HIV risk is high,[55] especially for women.[56,57]

Hepatitis C Virus

One review reported HCV prevalence among prisoners ranging from 3.1% to 38.0%,[35] with the highest in Central Asia.[58] Representative prison biosurveillance studies show HCV prevalence to be substantially higher in Ukraine (60.2%),[39] Kyrgyzstan (49.7%),[41] and Azerbaijan (38.2%),[40] even though self-reported lifetime injection prevalence was substantially lower. These data suggest drug-injection is often under-reported in surveys. HCV infection in PLH, when left untreated, complicates HIV treatment[1] and is associated with accelerated liver fibrosis.[59] New direct-acting antiviral HCV treatments have low toxicity, short treatment durations, and can cure HCV in over 90% of patients, irrespective of HIV status.[60] Restricted by affordability, the only EECA

prisoners in EECA receive HCV treatment in prisons is in Georgia where an HCV elimination strategy is underway.[61]

Tuberculosis

Prisons generally, and especially in EECA, promote TB transmission, particularly drug-resistant strains, primarily because of crowding that increases contact between large numbers of high-risk persons in poorly ventilated facilities over extended periods.[12,13] Furthermore, tuberculosis control is complicated by low cure rates due to delayed diagnosis, ineffective screening, isolation and treatment in prisons, perverse environmental disincentives (see Panel 2) to start or continue treatment (better housing, treatment or food, being excused from harsh work, profiting from the sale of TB medications).[62-64] Incarcerated individuals are at higher susceptibility for tuberculosis (poverty, SUDs, homelessness, malnutrition and HIV infection) and are often released to the community before treatment completion, without effective transitional care.[12,65-67]

Factors contributing to tuberculosis transmission include overcrowding, high prisoner turnover, limited access to healthcare services, delayed case detection and poor contact detection, lack of recommended rapid diagnostic methods like Xpert MTB/RIF, and suboptimal treatment of infectious cases and implementation of tuberculosis infection control measures.[65-67] MDR-TB is disproportionately prevalent in EECA prisons[68,69] because of high MDR-TB prevalence in the community[70-73] and large numbers of HIV-infected PWID who are more susceptible to tuberculosis due to being immunocompromised.[74] The Ukraine Case Study illustrates the large degree to which incarceration contributes to tuberculosis transmission in EECA, with it's tuberculosis incidence rates being directly correlated with increasing mass incarceration.[12]

Additionally, MDR-TB incidence in EECA after independence was directly correlated with increasing mass incarceration.[12]

The Soviet Union collapse resulted in inadequate funding and supply of first-line TB regimens and extended confinement that facilitated transmission within prisons.[75] In Belarus, MDR-TB strains are 35.3% of new and 76.5% of previously-treated TB cases, meaning that half of all TB cases are MDR-TB.[69,76] Incarceration and HIV are independent contributors to patients having MDR-TB strains.[69] Remarkably high levels of MDR-TB cases also exist in Russia,[77,78] Lithuania and Latvia,[78] and Ukraine.[79] International guidance for TB screening and treatment[80] is inconsistently deployed in prisons throughout EECA with resultant poor outcomes.[65,67] One notable exception is Azerbaijan which reduced both TB and MDR-TB cases through the effective implementation of the WHO's Stop TB Strategy in the penitentiary sector, which involved routine screening, specialty TB hospitals, new infection control measures, rapid diagnostic testing, and training of prison personnel who now train prison staff elsewhere in EECA.[81]

Case Study: Modelling the Impact of HIV and TB transmission in Ukraine - a Country in Conflict

Ukraine, a middle-income country of 31 million, is in the midst of conflict and has the highest prevalence of HIV in adults (1.2%), with tuberculosis and MDR-TB contributing the most to HIV-related mortality.[3] Before Ukraine's conflict with Russia over Crimea and the Donbas region, Ukraine's incarceration rate per 100,000 population was 324, but recently dropped to 195 per 100,000 in 2014 with large numbers of prisoners rapidly released to the community, increasing numbers of arrests

and initiation of a new probation system that now supervises 70,000 people in the community. Incarceration among PWID in national surveys, however, does not appear to have decreased from 2011-2015.[82,83] HIV prevention services in Ukraine are under-scaled with only 2.7% of 310,000 PWID prescribed OAT and 20% of PLH prescribed ART. ART coverage in HIV-infected PWID, however, remains under 5%.[5] Globally and within EECA, PWID experience high levels of incarceration (lifetime: 40%-85%),[84,85] and current or previous incarceration is associated with heightened injecting risks and increased HIV and HCV transmission.[86-88] In Ukraine, minimally 52% of PWID have been incarcerated,[89-91] with previously incarcerated PWID reporting an average of 5 incarcerations, each a year in duration.[39,89,91]

Data from three recent national surveys among PWID and current prisoners in Ukraine were used for epidemiological analyses and HIV transmission modelling, described briefly in **Boxes 1 and 2** and further in the online appendices. These data suggest that previously incarcerated PWID have a significantly higher HIV prevalence than never incarcerated PWID (28% versus 13% - see **Figure S9**), even after controlling for injecting duration (aOR=1.8; 95%CI=1.6-2.1). Additionally, they have heightened HIV risk behaviours, with previously incarcerated PWID reporting 3.9 (95%CI=2.8-5.0) more injections per month,[89] and a 1.5-fold (95%CI=1.3-1.9) greater chance of sharing syringes[89] than never incarcerated PWID, even after controlling for injecting duration. Recently incarcerated PWID (past year) had an even greater likelihood of syringe-sharing (aOR=2.2; 95%CI=1.6-3.0).[45,92] Similarly, currently incarcerated PWID have over twice the HIV prevalence of never incarcerated PWID (28.5% versus 12.8%)[39,45] and high rates of syringe-sharing.[17,37] Together, these data

suggest that incarceration and the post-release period are important contributors to HIV transmission among PWID in Ukraine and forms the basis for our HIV modelling (**Box 1**).[39,45] This modelling suggests that incarceration, and specifically the heightened injecting risks post-incarceration could contribute 55% of new HIV infections among PWID in Ukraine over the next 15 years if we assume all this elevated risk is attributable to incarceration, or 28% if we conservatively assume that only the heightened risk among recently released PWID is due to incarceration (**Figure 3 and 4**). Conversely, reduced incarceration of PWID is unlikely to substantially decrease new HIV infections over 15-years due to the remaining elevated risk among previously-incarcerated PWID. Scaling-up and continuing prison-based OAT post-release, however, could avert 19.8% of HIV infections over 15 years because it directly reduces the heightened post-release risk (**Figure 3 and 4**).

TB incidence across EECA is high (nearly all over 100 per 100,000 population), and are positively correlated with country-level incarceration rates,[12] highlighting the importance of within-prison TB transmission to the countrywide epidemics. An ecological analysis estimated that across EECA, each percentage point increase in a country's incarceration rate corresponded to a 0.34% increase in TB incidence (95%CI=0.10%-0.58%).[12] A systematic review suggests that TB incidence in LMICs is 10 to over 30 times greater within prison than in the community.[93] Few studies, however, have estimated the contribution of incarceration to the TB epidemic in EECA, with the systematic review estimating that between 5% and 17% of TB cases in Russia could be due to exposure within prison.[93] We therefore conducted in-depth statistical analyses using the same datasets utilised for the HIV modelling[91] to evaluate the role of

incarceration for increasing TB disease risk among the general population and PWID in Ukraine (**Box 2**). These analyses suggest that incarceration is an important contributor to TB transmission (**Figure 5**), and could be responsible for three-quarters of new yearly TB infections among PWID and 6.2% of all yearly TB infections in Ukraine.

Risk Environment Framework for Criminal Justice Settings in the Region

Figure 2 provides an overview of the *risk environment* factors in both the community and CJS that contribute to onward disease transmission in EECA. The high prevalence of these infections in the community, coupled with both micro-level and macro-level factors embedded within the physical, social, economic and policy/legal framework, result in the concentration of high-risk key populations like PWID and sex workers in the CJS. Incarceration, a physical factor, further amplifies these conditions by concentrating individuals with these infections. It also disrupts injection and social networks, a social factor, by creating new and riskier networks that develop as a survival tactic during incarceration.[94] Policy factors forbidding OAT and NSP in Ukrainian prisons, where HIV prevalence is high (19.4%),[39] HIV detection and ART coverage is low,[45] facilitate frequent sharing of injecting equipment by PWID[17] and likely fuels HIV and HCV transmission.[17,39,41,45] Similarly, individuals released from prison are highly stigmatized (social factor), relapse to drug use quickly (policy factor), develop new injection networks (social factor), and policing efforts target PWID and former prisoners due to registration of PWID in the community (policy factor).[37] Our analyses from our Ukraine Case Study suggest that the prison risk environment contributes to both HIV and TB transmission in PWID and TB transmission more generally to the

community. Moreover, introducing OAT to 50% of PWID within prison and retaining them in treatment for 12 months post-release would most-effectively reduce HIV incidence over the next 15 years, suggesting that this risk environment can be greatly influenced by the introduction of evidence-based addiction treatment.

Drug-related policies

Key populations face numerous legal barriers that simultaneously contribute to incarceration and to accessing essential HIV programmes and services.[95,96] Drug policies vary considerably. In seven EECA countries (Russia, Uzbekistan, Ukraine, Belarus, Moldova, Lithuania and Latvia) official names-based "registration" of PWID is required to receive treatment, including OAT. Registration, however, often results in restrictions in employment, loss of privileges (e.g., driver's license) and targeting by police.[37,97,98,99] Moreover, a passport and an official address is required for employment in Ukraine, undermining economic stability.[98] Collectively, these restrictions perpetuate reincarceration,[100] especially given that alternatives to incarceration are uncommon in any EECA country. Addiction experts are required to report anyone accessing services, including for diagnosis confirmation, registration and treatment. In most registries, there is little guidance or criteria to remove names from the registry or how recovery is defined. In Moldova and Uzbekistan, PWID are monitored for three years before removal from the registry is considered. In Uzbekistan, removal from the registry occurs upon incarceration. Otherwise, name-based registries persist for life.

Six countries have a mix of administrative and criminal penalties for drug possession. In Kazakhstan, administrative procedures can be deployed twice-annually for drug possession, after which arrest and criminal sanctions ensue. In Kyrgyzstan,

these penalties differ based on the quantity of illicit drugs found. Elsewhere, administrative procedures are used for limited personal use amounts although the amount varies. In all countries, the criminal code defines the purchase of illicit drugs as an incarcerable criminal offense.

Punitive drug laws restrict access to HIV testing and treatment for PWID. Criminalisation of drug use and discriminatory practices restrict access to NSP and community agencies where these services are located. Harm reduction services are often legally restricted to adults. Police in some countries arrest PWID who access harm reduction services and confiscate drugs and syringes or extract bribes for the possession of syringes or needles.[37,38,101,102] In one Russian survey of PWID, over 60% had been arrested for needle possession or had drugs planted on them by the police.[103]

Sexual Activity Policies

While many EECA countries have repealed laws prohibiting same-sex relationships, Uzbekistan and Turkmenistan continue to enforce them. Tajikistan, Uzbekistan, Ukraine and Armenia have laws that criminalize sex acts between consenting adults of the same gender, sodomy, “cross dressing” or “gender impersonation”. Kyrgyzstan and Tajikistan have legislation where the age of consent differs for homosexual and heterosexual sex; Kyrgyzstan has laws or policing practices criminalizing or preventing condom distribution yet supplies them within prison. Though transparent in their intent to target and stigmatize MSM, Russia enacted legislation prohibiting dissemination of “propaganda of non-traditional sexual relations [i.e., LGBT] among minors” to protect '"traditional" family values, These laws result in arrest of individuals promoting HIV prevention for MSM. Similar but harsher legislation is being

considered in Belarus, Kazakhstan and Kyrgyzstan.[43]

All EECA countries prohibit sex work, but police enforce it variably and target sex workers who use drugs. Kyrgyzstan, Azerbaijan and Uzbekistan have laws or policies allowing mandatory HIV testing of key populations. Some countries (Kyrgyzstan, Tajikistan, Uzbekistan, Ukraine and Armenia) have laws that protect against human rights violations but they are not specific to HIV or key populations.

Community supervision

Community sanctions like probation or drug courts are not widely available, and probation is not generally linked to treatment. Several countries have limited community-based supervision, including Russia (supervision by former military/prison personnel), Ukraine (new in 2015), Moldova (started 2002), Latvia (started in 2005), Estonia (started in 1998 with expansion in 2013), Lithuania, Georgia and Kazakhstan. Pilot projects are underway in Armenia to guide probation service initiation. Some probation programs refer cases to drug treatment agencies or psychiatric hospitals. Many of the probation programs emerged from the prison service and therefore reflect the prison culture. In most instances, probation is in its infancy.

Coverage with Opioid Agonist Therapies

Many prisoners in EECA not only initiate drug injection within prison, but continue to share injecting equipment during incarceration[17,41] and especially post-release.[17] Five countries (Armenia, Kyrgyzstan, Moldova, Latvia and Estonia) have OAT in prisons, with coverage being extremely low. Georgia has a pilot program in SIZO and four others offer it only in police-lockup (**Table 1** and **Figure 6**). Emblematic for the region, Ukraine's prison personnel have especially negative attitudes toward OAT, but is

improved when sufficiently knowledgeable about its benefits,[25] while prisoners have higher expectations about recovery that diminish post-release in the absence of OAT.[104] In Moldova, OAT and NSP exist within communities and prisons, but OAT coverage is disproportionately lower in the community than in prisons, reducing access post-release and necessitating many OAT patients to discontinue OAT before release. In Moldova, PWID on OAT are often ostracized within the prison risk environment perhaps due to within-prison illicit drug economies that compete with OAT.[25,105] Thus, effective and essential OAT scale-up must educate and motivate both prisoners and personnel.

HIV diagnosis

The first step to achieving the UNAIDS 90-90-90 HIV treatment as prevention strategy is HIV testing.[53] Most EECA prisons deploy risk-based opt-in testing within prisons. One of the major challenges in EECA prisons is low HIV detection, where over half of HIV-infected prisoners do not know their HIV status.[39,41,42,45] For those that do, however, most are tested within prison.[39-41,45] Notable exceptions where expanded HIV testing greatly improved HIV diagnosis include Estonia[106] and Azerbaijan.[40] Required name-based HIV registries often undermine voluntary testing efforts and treatment engagement.[97,107] Officially reported HIV data therefore underestimates[108] true prevalence and restricts access to HIV treatment due to mandatory registration combined with stigma, discrimination and criminalization of key populations.[6,97,107] Similarly, OAT patients must be officially "registered" before receiving it, which can lead to restrictions on employment opportunities, limitations in housing, and revocation of drivers' licenses, which further compounds economic disparities.[107]

Conclusions

The 1990 United Nations Basic Principles for the Treatment of Prisoners state that prisoners "shall have access to the health services available in the country without discrimination on the grounds of their legal situation."[109] This basic principle has been expanded in the case of HIV to also include preventive services, but has been infrequently applied, especially in many EECA countries where prisoners derive less benefit from prevention and treatment services than other citizens.[110] Structural aspects of the CJS in EECA concentrate most at-risk populations, which, taken together, likely contribute heavily to disease amplification and transmission within prison and to the community post-release. These structural impediments also limit access to prevention and treatment services for HIV, HCV and TB. Findings here suggest that the high-risk prison environment, including the immediate period post-release (for HIV), is an important contributor to HIV and TB transmission to PWID and more broadly for TB transmission to the general population. Strategies that reduce incarceration overall, especially for PWID and greatly expand OAT within prison and effectively continue it post-release are likely to have the greatest impact on HIV and TB transmission in PWID interfacing with CJS. Strategies that reduce incarceration for the entire population, but especially for PWID, are likely to reduce tuberculosis cases. Not only are policy reforms necessary to abrogate this trajectory, but further epidemiological, qualitative, modelling, cost-effectiveness and implementation science research is crucial to help ensure that both prisoner and public health is optimized and consistent with human rights mandates (**Panel 3**). Such approaches could reduce the transmission of HIV, HCV and TB in these settings especially if they also ensure continuity of care following release from prison.

END OF MAIN BODY OF PAPER: Abstract (248) and paper (5,072) words after removing key messages, comprehensive review strategy, and references to boxes, panels, tables and figures.

ADDITIONAL COMPONENTS

1. BOX 1: HIV Modelling for Ukraine (WORDS: 688)
2. BOX 2: TB epidemiological analyses for Ukraine (WORDS: 566)
3. PANEL 1: CANDLES BURNING IN THE NIGHT (WORDS: 541)
4. PANEL 2: SASHA AND THE VICIOUS CYCLE (WORDS: 796)
5. PANEL 3: Recommendations for Policy Changes
6. COMPREHENSIVE REVIEW SEARCH STRATEGY

Box 1: Modelling the Impact of Incarceration and Scale-up of Opioid Agonist Therapies in Prisons on HIV Transmission among People Who Inject Drugs in Ukraine

**References 111 and onwards in Ukraine Case Study are available in the online appendix*

A national, dynamic model of incarceration and HIV transmission through drug injection among PWID was developed, that stratified PWID by incarceration state (never, current, recently released within last 12 months, and past incarceration over 12 months ago), and HIV infection state (susceptible, initial acute and chronic HIV infection, and receiving ART). Within a Bayesian framework,[111] the model was calibrated to detailed national data on the incarceration of PWID (**Table S1**),[39,45,91,92,112] and HIV prevalence (**Table S3**) among never (11.9%–13.6%), current (22.2%–35.4%), and previously incarcerated PWID (26.6%–29.7%).[39,45,92] Based on the same national data, this calibration assumed elevated injection-related HIV transmission risk among previously incarcerated PWID (relative risk 1.9-3.3 within 12-months post-release and 1.4-2.0 thereafter) compared to never incarcerated PWID. Sensitivity analyses relaxed this assumption. Due to insufficient data, a non-informative prior was used for the transmission risk among incarcerated PWID.

To estimate the long-term population attributable fraction (PAF) due to incarceration, the relative decrease in new HIV infections over 15 years was projected if the transmission risk among currently- and previously-incarcerated PWID were set to the same as never-incarcerated PWID. A conservative PAF assumed the transmission risk among recently-released PWID was the same as previously but not recently-incarcerated PWID. We also examined how OAT scale-up to 50% of incarcerated

PWID, with 12-month OAT continuity post-release, could reduce HIV transmission. The supplementary materials provide more methodological details.

When assuming heightened HIV transmission risk in previously incarcerated PWID, the model (**Figures 3 and 4**) suggests that community HIV incidence and prevalence would decrease dramatically by 2030 (by 75%; 95%CrI=64%-87%, and 56%, 95%CrI=42%-66%, respectively) if the HIV transmission risk among currently- and previously-incarcerated PWID were set equal to never-incarcerated PWID. Additionally, 55.1% (95%CrI=40.2%-68.2%) of new HIV infections would be prevented, mainly due to reducing the heightened risk among recently-released PWID. Indeed, 28.2% (95%CrI=13.6%-41.1%) of HIV infections would be averted if this heightened risk was only partially reduced to the same as non-recently incarcerated PWID. These findings were robust to making less restrictive assumptions about the relative transmission risk among previously incarcerated PWID. By contrast, if PWID had no new incarcerations after 2015, only 12.8% (95%CrI=-4.7-24.6%) of new HIV infections would be averted thereafter. If prison-based OAT were initiated in Ukraine, however, our modelled scenario suggests 19.8% (95%CrI=14.6%-24.5%) of HIV infections would be averted during 2015-2030, and community OAT coverage would increase by 8.3%. Much of this impact is due to benefits of retaining prisoners on OAT post-release, with only 5.6% (95%CrI=1.6%-8.3%) of HIV infections being averted without OAT continuation. Further projections suggest that community OAT (without prison-based OAT) coverage levels of 28% (95%CrI=20%-33%), 48% (95%CrI=43%-50%) or 16% (95%CrI=12%-21%) would be required to achieve the same impact as scaling-up prison-based OAT, depending on whether this community OAT was untargeted or targeted to never- or previously-

incarcerated PWID, respectively. Considering the prevention benefit per PWID on OAT, the prison-based OAT scenario is as efficient as targeting OAT to previously incarcerated community PWID, but is 1.6 and 3.2 times more efficient than untargeted community OAT and OAT targeted to never-incarcerated PWID, respectively.

These analyses suggest incarceration is a driver of HIV transmission among PWID in Ukraine, with 55.1% (95%CrI=40.2-68.2%) of incident HIV infections possibly attributable to incarceration if we assume all the elevated risk among previously incarcerated PWID results from incarceration, or 28.2% (95%CrI=13.6-41.1%) if we conservatively assume only the additional risk among recently released PWID is due to incarceration.

Importantly, increases in risk behaviours post-incarceration fuel the HIV epidemic in Ukraine's PWID, highlighting the need to strategically target HIV prevention interventions to previously-incarcerated PWID. Findings here, and confirmed elsewhere, suggest prison-based OAT expansion with effective community transition post-release could be an effective strategy of achieving this.[113-116] Strategies that reduce incarceration, like alternatives to incarceration (e.g., probation, drug courts), community policing that promotes treatment over arrest and changes in drug criminalisation policies should also be considered, although the HIV benefits may be less.

Our analyses have limitations (supplementary materials), most specifically related to whether the elevated transmission risk among previously-incarcerated PWID is due to incarceration or higher-risk PWID being incarcerated frequently; future studies should examine longitudinal changes in risk before, during and after incarceration.

Box 2: Modelling the Impact of Incarceration on Tuberculosis Transmission in People Who Inject Drugs and More Broadly to the General Population in Ukraine

**References 111 and onwards in Ukraine Case Study are available in the online appendix*

Statistical analyses (See online TB supplement for detailed methods) were performed using national survey data to assess the short-term yearly contribution of incarceration to recent and lifetime TB transmission among both PWID and the general public in Ukraine. Data sources included country-wide data from 1,612 PWID in the 2015 ExMAT survey and 402 prisoners in the 2011 PUHLSE survey (see online appendix). ExMAT provided individual-level data on incarceration (ever, total time), HIV status, drug injection duration, and TB status in last 12 months and ever. PUHLSE provided individual-level data on age, total time incarcerated, HIV status, ever-injected drugs, and ever TB status. Self-reported TB status was used for all analyses using a highly-validated survey question.[117]

Using both datasets, linear regression models were firstly developed to evaluate the relationship between ever and recent TB status and ever being incarcerated or total duration of incarceration. Two survival models were then fitted to data on cumulative TB risk as a function of time in prison. Using the estimated hazard, an average TB incidence rate was estimated for each year of incarceration among prisoners (PUHLSE) or previously incarcerated PWID (ExMAT). The estimated incidence rate among prisoners (PUHLSE) and data on self-reported recent risk of TB (ExMAT) were then used to estimate the relative risk of TB among incarcerated PWIDs or prisoners overall compared to non-incarcerated PWIDs or the community as a whole,[118] and the

population attributable fraction (PAF) of incarceration to overall TB risk and TB risk among PWID were estimated using standard formula.

Our analyses consistently suggest that incarceration contributes significantly to TB transmission in Ukraine. After controlling for age, injecting duration and other variables; we estimate that for every additional year of incarceration there is a 13% (95%CrI 8%-17%) relative increase in TB prevalence among the overall population and a 6% (95%CrI 3%-10%) relative increase in TB prevalence among PWID (**Figure 5**).

Although only 0.5% of the adult population was incarcerated, we estimate that 6.2% (95%CI=2.2%-13.4%) of all incident TB cases result from incarceration. Conversely, among PWID this increases to 75% (95% CrI=51%, 94%) for HIV-infected PWID and 86% (95% CrI=56%, 98%) among HIV-negative PWID (See online appendix for details).

Our analyses from Ukraine indicate that the contribution of incarceration to TB in the general population was similar to findings from Russia,[93] and provides new insights that suggest a markedly higher PAF of incarceration to TB transmission among PWID. Although data suggest the importance of incarceration for TB,[12,93,119,120] there is a paucity of data surrounding the contribution of prison to TB incidence in LMIC, especially in EECA where TB incidence is high. Nevertheless, other studies and data presented here indicate that prisons contribute substantially to TB epidemics broadly, but especially in PWID in this region (**Panel 2: Sasha's Story**). While strategies that reduce incarceration for PWID would have the greatest impact, these findings also underscore the need to develop cost-effective interventions to diagnose, treat, and prevent TB transmission among incarcerated populations. Azerbaijan has emerged as a

regional leader in implementing such programs[81] where they have adopted TB prevention activities within prison (screening, early detection and treatment, case isolation and preventive therapy for latent tuberculosis infection). Such strategies, especially if focused on PWID, should address the increased TB transmission risk associated with current and/or previous incarceration. Such strategies, including HIV prevention and treatment, are urgently needed to control the HIV and TB epidemics in Ukraine and other EECA settings.

Panel 1: Candles Burning in the Night

Despite its well-documented efficacy in both prisons and communities, three EECA countries (Russia, Uzbekistan and Turkmenistan) legislatively ban any type of OAT, while the remainder provide it in the community. Harsh criminalization policies that result in high incarceration rates and large numbers of PWID in EECA prisons, compounded by high levels of documented within-prison drug injection in the region, extraordinarily high levels of HIV, viral hepatitis and TB and MDR-TB persist, Despite these poor prognostic indicators, a few countries have prevailed over the misaligned ideological policies espoused by Russia that favour punishment over rehabilitation and implemented internationally recognized evidence-based HIV prevention and treatment for prisoners.

For example, small and financially vulnerable countries like Kyrgyzstan, Moldova and Armenia have introduced all 15 internationally-recommended HIV prevention strategies in prisons,[121] including both OAT and NSP. These countries have emerged as beacons in the region and have boldly introduced such programs despite external influences to ban them altogether, albeit suboptimally scaled, but have done so with external funding from international donors. These successful programs, however, may soon be jeopardized by anticipated loss from international donors. Moreover, as Russia is increasingly exerting external pressure and creating new political and trade alliances with some former countries of the Soviet Union, they too extend their ideological principles and financial support in ways that could eventually threaten and undermine the successes made by these public health and human rights-based HIV prevention interventions in prisons.

It is conservatively estimated that one-third of all prisoners in Kyrgyzstan, Moldova and Armenia are PWID (approximately 6,900), primarily of opioids. Yet, only 802, or 11.6% are prescribed OAT. OAT introduction and even scale-up is minimally restricted by cost, since methadone is extremely inexpensive. While its efficacy is well-substantiated, OAT policy is shaped more by ideology and prejudices against OAT than by scientific evidence.[122,123] Despite these ideological influences in the region, five countries (Armenia, Moldova, Kyrgyzstan, Latvia and Estonia) have successfully introduced and expanded OAT throughout their CJS, including in pre-trial detention (See **Table 2**). Recent findings from Moldova, which may be emblematic of prison-based methadone problems in the region, suggest that myths about and prejudices toward OAT are amplified within prisons and result in bullying and ostracism of OAT patients, and may undermine OAT expansion efforts.[105] In nearby Ukraine, where OAT is not available within prison, extremely negative attitudes toward OAT prevail among prison personnel, but recent findings suggest that provision of accurate information and training may in part overcome these myths.[25,104] Because the within prison risk environment is shaped by PWID, non-PWID, prison personnel and real and enacted policies for the setting, the next generation of OAT expansion efforts will therefore need to address multiple factors including these myths and prejudices and the within prison drug economy that likely propagates such myths to both incarcerated PWID and to prison personnel who may view OAT as competition for the illicit drug trade. Continued support for OAT and NSP must therefore not only address service delivery itself, but include strategies that combat misinformation and prejudices. Continued funding and provision of comprehensive prevention strategies are crucial for sustainability and should be coupled with shared

best-practices with other EECA countries that seek to align human rights and public health mandates in both community and criminal justice settings.

Panel 2: Sasha* and the Ravages of Incarceration

Prisons here in Russia are places where people like me go to die. Though arrested often, I went there three times where I watched many people like me die. My first time occurred after police stopped me for a bribe. I had no money so he searched me, found a syringe he said contained heroin, and locked me up. When I got sick from withdrawal symptoms and was most vulnerable, they promised “shirka” [liquid poppy straw extract] if I admitted to stealing something that I didn’t. I refused, spent a year in SIZO awaiting trial, but was finally convicted for two more years because drug users like me don’t stand a chance. I was shocked to learn that drug injection in SIZO and prison was worse than on the streets of Gatchina, where I lived. The guards helped supply drugs and prison leaders made sure we remained addicted. Many of us paid with our lives. Some guys overdosed, others became HIV-infected like me and tuberculosis finished off the rest of us. Even though all of us were sick, seeing a doctor and getting care was nearly impossible. The bosses controlled everything. I swear the doctors were even worse than the guards. They just sent us back to our dorms to die.

I was luckier than most and survived my first incarceration. I tried to be strong and avoid drugs. I cut back, but I had money and connections so I still used. I was weak and the prison bosses made sure I could get high and keep their pockets full. Within a week of release, I was back at it again. The police knew it too! They stayed on top of me, extracting their bribes, but once I ran out of money, I was arrested and back in SIZO and prison for another three years. This time, they sent me to a colony for seasoned criminals.

I developed fevers and lost a lot of weight. I was sure I would die. My family had money and I was able to bribe my way and eventually saw a doctor. Without money, I would have died like everyone else. After 6 months of coughing and 15 pounds lost, my money bought me a fluorogram that was suggestive of TB and I was shipped to a specialty TB colony. It seemed like everyone with TB also had HIV. I survived the scariest place I had ever been. We were 36 men in a “closet” with only 12 beds. We stood, coughed on each other, while others slept in shifts. Most guys, including me, would stop or dispose of our TB medications so that we could get sick and move from our “closet” to the infirmary where we’d get our own bed. Many who went to the infirmary never left except in a pine box because their medications didn’t work anymore.

I must be really strong. As soon as I got out, my parents took me to the local TB dispensary. Even though I told the doctors about what happened, they didn’t believe me and I went through the entire process again of confirming TB. I received no medications for several months, developed fevers, drenching night sweats and weight loss again before they would prescribe medications. I told them the medications had stopped working before, but they started me on the same ones I took before. It was no surprise that medications didn’t work.

I got sicker and my parents drove me to St. Petersburg to a special hospital and paid a lot of money for the doctors to find me a bed, prescribe new TB medications, and for the first time assessed my HIV with a CD4 count. Thankfully, my HIV was not a problem, but they said the TB might kill me. A doctor from the AIDS Centre said that he would bring me HIV medications if my parents would “donate” some money for the convenience. I remained connected to an IV for two months and received many TB

medications my parents bought. The TB and HIV medications began to work. My cough and fevers went away, I gained weight, but I went home taking an entire cup of pills every day for almost two years.

I know I almost died. Daily, I crave *shirka*! My mom knows me and never lets me out of her sight. Even when I try to make excuses to get some time alone, she never leaves my side. She knows me. I know me too! One minute alone and I know I will find *shirka*. If I do, I know I will get another free ticket to prison or to heaven. Either way, I am in prison. I prefer the prison in my house over the one where I know nobody cares.

** Sasha is not his real name.*

Panel 3: Recommendations for Prevention and Treatment Policies

- **Develop strategies to reduce incarceration rates in key populations.** Laws and policies that criminalize personal drug use and sex work should be changed. New strategies should be developed that directly aim to reduce incarceration, especially to address TB transmission in PWID. Modelling here confirm the negative contributions of incarceration, especially on PWID, on perpetuating the HIV and TB epidemics. For example, current policing policies target high-risk individuals (i.e. PWID, registered drug users, sex workers etc.) and few provide community policing that focus on engaging drug users in evidence-based addiction treatment or harm reduction services in the community. Development of community policing efforts, pre-booking diversion programs, alternatives to incarceration such as drug courts or community supervision in probation that favours rehabilitation and treatment over incarceration are needed. Quality community supervision in probation that engages PLH or those at risk for HIV in community settings where supportive social networks remain and prevention and treatment is uninterrupted is crucial.

- **Improve HIV Testing and Treatment Strategies:** In order to meet UNAIDS policies for 90% detection, ART coverage and viral suppression (90-90-90), EECA prisons must improve HIV testing strategies because HIV identification falls far lower than UNAIDS targets. While some countries meet ART coverage mandates, room for improvement remains. Identifying HIV and increasing ART coverage within prison must, however, be linked to ART continuity post-release, including linkage to OAT.

- **Reduce gap between prison and community healthcare services**. Prisoners with comorbid conditions have a right to the same standard of prevention and treatment services as those in community settings.[124] SUDs should be addressed as chronic, recurring health conditions that should be screened for and treated by the same standards provided in the community. OAT programs are markedly less expensive than imprisonment and modelling here suggest that the most effective strategy to reduce HIV transition is to increase OAT coverage to PWID within prison and effectively transition them to OAT post-release. Where international donors fund HIV treatment and prevention (e.g., GFMTA, PEPFAR), these agencies should stipulate that such prison-based programs are both introduced and scaled-to-need as part of a national strategy as a requirement for continued funding.

- **Introduce and expand OAT, NSP and ART in CJS**. Modelling of HIV transmission here suggests that scaling up OAT coverage to 50% combined with retention post-release during the heightened risk period, would reduce new infections in PWID the most. National guidelines for HIV prevention and treatment should specifically stipulate equivalence of treatment in community and CJS. International agencies support 15 evidence-based practices in CJS. And where such stipulations exist, implementation and monitoring should specifically address CJS settings. Despite the existence of national guidelines, there is a failure to implement a comprehensive drug policy in prisons that includes: psychological support, NSP, OAT, and ART. Crucially, the scale-up of these interventions in CJS should coincide with improving

continuity of care and prevention post-release – this could have substantial HIV prevention benefit.

- **Access to integrated care.** Compared to those in the community, prisoners carry a higher burden of disease with multiple medical and social comorbidities that require a comprehensive strategy to address HIV, HCV, TB and sexually transmitted infections, as well as psychiatric and substance use disorders. While policies that favour alternatives to incarceration are preferred, for those who do interface with the prison environment, such settings provide an opportunity to screen, treat and provide continuity of care post-release to those otherwise missed by community prevention and treatment services.

- **Align Prisoner Health with International HIV Prevention and Treatment Goals:** The 90-90-90 UNAIDS HIV prevention and treatment goal to diagnose, treat and achieve viral suppression in 73% of all PLH should be extended to prisoners where the HIV continuum of care in EECA is poorly characterized. To achieve this goal, innovations in HIV testing (e.g. routine testing that has been successful in other settings where it was linked to treatment), provision of ART to all PLH and achieving viral suppression through optimal ART adherence will require not only changes in prison-based services, but also in transitional programs to the community. Modelling here suggests that the transitional care, especially by providing OAT during incarceration and sustaining it post-release will be crucial to reduce HIV prevalence in the long-run.

- **Continuity of care**. Prison prevention and treatment should be embedded within a national framework for providing continuous care within SIZO, prison and following community release. Our modelling suggests that providing continuity of interventions such as OAT post-release is key for achieving large HIV prevention benefit among PWID. The CJS should be just another setting to provide care to a concentrated population with comorbid conditions. Partnerships with non-governmental organizations should be encouraged to ensure that prevention and treatment services are maintained.

- **Education**. To successfully implement evidence-based screening and treatment for SUDs, HIV, HCV and TB, continuing education is essential to directly address and reduce negative attitudes toward people with SUDs and HIV in order to reduce both stigma and discrimination. Such professional development should not only target medical personnel, but also custodial staff to better align efforts to engage to promote health and wellness in prisoners.

- **Implementation of organizational strategies**. CJS administrators and staff need to understand that providing healthcare, especially to PWID, is the best strategy to reduce recidivism and improve public health. The success of many international efforts to expand harm reduction strategies has been accompanied with efforts to

help staff understand the value of providing healthcare. This is a long-term strategy to better integration of health and safety policies.

Table 1: Overview of Prison Population in Eastern Europe and Central Asia*

	AZE	KAZ	KYR	TAJ	TUR	UZB	RUS	UKR	BEL	MOL	LIT	LAT	EST	ARM	GEO
Prison population															
	~16,500	44,893	10,060	~9,000	30,568	~42,000	656,618	57,396	31,700	5,329	6,634	3,276	2,775	3,894	9,724
Estimated Number of People Who Inject Drugs															
Community	71,283	116,840	25,000	25,000	NA	80,000	1.8 million	332,500	75,000	30,200	5,403	10,034	9,000	3,310	45,000
Prison	31.9%	—	30.4%	—	NA	—	—**	48.7%	—	—	—	—	—	5.5%	—
Antiretroviral Therapy Coverage															
Community	14%	4,639	13%	10%	NA	24%	178,711	26%	21%	17%	542	1,055	2,998	16%	39%
Prison	63.2%	34.3%	69.9% of those registered 243	59.1%	NA	—	5.0%	6.4%	—	63.1%	23.2%	19.3%	—	77.3%	87.5%
HIV prevalence															
Community	0.1%	0.2%	0.3%	0.4%	<0.2%	0.2%	1.1%	1.2%	0.5%	0.6%	0.1%	0.7%	1.0%	0.2%	0.3%

Prison	3.7%	3.9%	8.4%	2.4%	0	4.7%	6.5%	19.4%	—	2.6%	3.4%	20.4 %	14%	2.4%	0.90 %
TB Incidence or Prevalence[a]															
Community ++	77	99	142	91	64	82	84	94	58	153	62	49	20	45	106
Prison	152	2,110[a]	145	162						184	58[a]	69			56
Opioid Dependent Persons															
Community	1.5%	1.0%	0.80%	0.54 %	—	0.80%	2.3%	0.91%	0.59 %	—	0.24 %	0.66 %	—	0.16 %	1.36 %
Prison	32.5%	3.0%***	145***	5.0%	—	—	—	44.3%	—	6.6%***	7.6%	30.0 %	—	—	—
Opioid Agonist Therapy Sites (N)															
Community	2	10	23	6	NA	NA	NA	169	19	3	23	10	9	10	21
Prison	NA	NA	7	NA	NA	NA	NA	NA	NA	9	NA	9	4	9	2+
Opioid Agonist Therapy Coverage (N)															
Community	137	205	1,227	677	NA	NA	NA	8,264	1,066	392	930	424	919	430	2,600

Prison	NA	NA	400	NA	NA	NA	NA	NA	NA	68	NA	26	56	151	—

Countries: **AZE**: Azerbaijan; **KAZ**: Kazakhstan; **KYR**: Kyrgyzstan; **TAJ**: Tajikistan; **TUR**: Turkmenistan; **UZB**: Uzbekistan; **RUS**: Russia; **UKR**: Ukraine; **BEL**: Belarus; **MOL**: Moldova; **LIT**: Lithuania; **LAT**: Latvia; **EST**: Estonia; **ARM**; Armenia; **GEO**: Georgia.

*All values are from the survey administered for this study in collaboration with UNODC and refer to 2015, unless otherwise specified in the online appendix.
**A cell is left blank if the information was not filled out or unavailable; NA signifies that the service is not provided.
***Refers only those officially registered as opioid dependent with the National Narcological Registry.
+Present only as a pilot program in SIZO (pre-trial detention) for detoxification and not for maintenance therapy
++per 100,000 people
Legend: OAT: opioid agonist therapies; ART: antiretroviral therapy; PWID: people who inject drugs

Table 2: Overview of the policies and practices related to HIV infection and harm reduction services in prisons of Eastern Europe and Central Asia[1,2]

	AZE	KAZ	KYR	TAJ	TUR	UZB	RUS	UKR	BEL	MOL	LIT	LAT	EST	ARM	GEO
Ministry overseeing prisoner health	Justice	Interior	Prison	Justice	Interior	Interior	Prison	Prison	Interior	Justice	Justice	Justice	Justice	Justice	Prison
Prisons, N	35	76	11	13	14	42		146		12	7	11		12	15
Male	16	69	10	12	12	39		131		10	6	10		11	11
Female	1	6	1	1	1	1		15		1	1	1		1	1
Prisoners, N	~16,500-	44,893	7,961	~9,000	30,568	~42,000		57,396		5,329	6,643	3,276	2,775	3,894	9,724
Women, %	2.8	7.7	4.0	3.3	24.8	3.0		5.6		6.6	3.7	7.4		4.5	3.3
Incarceration rate[+]	236	231	181	130	583	152	446	193	306	215	268	239	218	132	274
Occupancy rate, %	81.4	71.8	55.5	61.5	85.0	80.0	94.2	120.24	96.8	102.9	83.1	59.5	96.3	89.3	47.8
NSP	No	No	Yes	Yes	No	No		No		Yes	No	No		Yes	No

Start date			2005	2010						1999				2004	
Facilities			10	1						10				9	
OAT	No	No	Yes	No	No	No		No		Yes	No	Yes		Yes	No
Start date			2008							2005		2012		2011	
Facilities			7							9		9		9	
People			400							68		26		151	
Detoxification with methadone or buprenorphine	No	No	No	N	N	No		No		Yes	No	No		No	Yes
Non-pharmacological detoxification	Yes	No	Yes	No	NA	No		Yes		No	Yes	Yes		Yes	No
HIV testing & counselling	Yes	Yes	Yes	Yes	Yes[3]	Yes		Yes		Yes	Yes	Yes		Yes	Yes
Start date		1997	2001	2003		2003		2006		2008		1994		2004	2004

Condom provision	Yes	Yes	Yes	Yes	No	No		Yes		Yes	Yes	No			Yes
Start date	2011	2002	2005	2003				2008		1999	2004				2004
ART	Yes	Yes	Yes	Yes	No	Yes		Yes		Yes	Yes	Yes		Yes	Yes
Start date	2007	2005		2007		2008		2008		2004		1998		2005	2005
TB fluorography	Yes	Yes	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes		Yes	Yes
Start date	1995	1998	1997			1991				1996		2011		2004	1998
TB treatment	Yes	Yes	Yes	Yes	Yes[3]	Yes		Yes		Yes	Yes	Yes		Yes	Yes
Start date	1995		1998			2004				1996	1998				1998
HCV diagnostics	Yes	Yes	Yes	Yes	NA	Yes		No		Yes	Yes	Yes		No	Yes
Start date	2006		2005	2015						2004					2014
Treatment of HCV	No	No	No	No	NA	No		No		No	Yes (acute only)	No		No	Yes

HBV diagnostics	No	Yes	Yes			Yes		No		Yes	No	Yes		No	Yes
Treatment of HBV	No	No	No			Yes		No		No	No	Yes		No	No
HBV vaccination	No	No	No			No		No		No	No	No		No	No
Programs on prevention of physical and sexual violence	Yes	Yes	No			Yes		No		No		No			Yes
Staff protection program against HIV as an occupational hazard	No	Yes	Yes			Yes		Yes		Yes	Yes	Yes		No	Yes
Post-exposure prophylaxis	No	Yes	Yes	Yes		Yes		No		Yes	No	No		No	No
Start date			2010												
Diagnosis & treatment of STIs	Yes	Yes	Yes			Yes		Yes		Yes		Yes		Yes	Yes

Legend: ART=antiretroviral therapy; OAT=opioid agonist therapy; STIs=sexually transmitted infections

Countries: **AZE**: Azerbaijan; **KAZ**: Kazakhstan; **KYR**: Kyrgyzstan; **TAJ**: Tajikistan; **TUR**: Turkmenistan; **UZB**: Uzbekistan; **RUS**: Russia; **UKR**: Ukraine; **BEL**: Belarus; **MOL**: Moldova; **LIT**: Lithuania; **LAT**: Latvia; **EST**: Estonia; **ARM**; Armenia; **GEO**: Georgia.

*All values are from the survey administered for this study in collaboration with UNODC and refer to 2015, unless otherwise specified.

[2] A cell is left blank if the information was not completed in the survey.
[3] “People,” “treated,” and “tested” refer to the total number of people receiving service in 2014.
[4] Available only as a pilot project.
[5] Women and juveniles housed in the same facility.
[6] Refers to incident cases
[+] (Number of prisoners per 100,000 population)

Figure 1: An overview of the criminal justice system in Eastern Europe and Central Asia

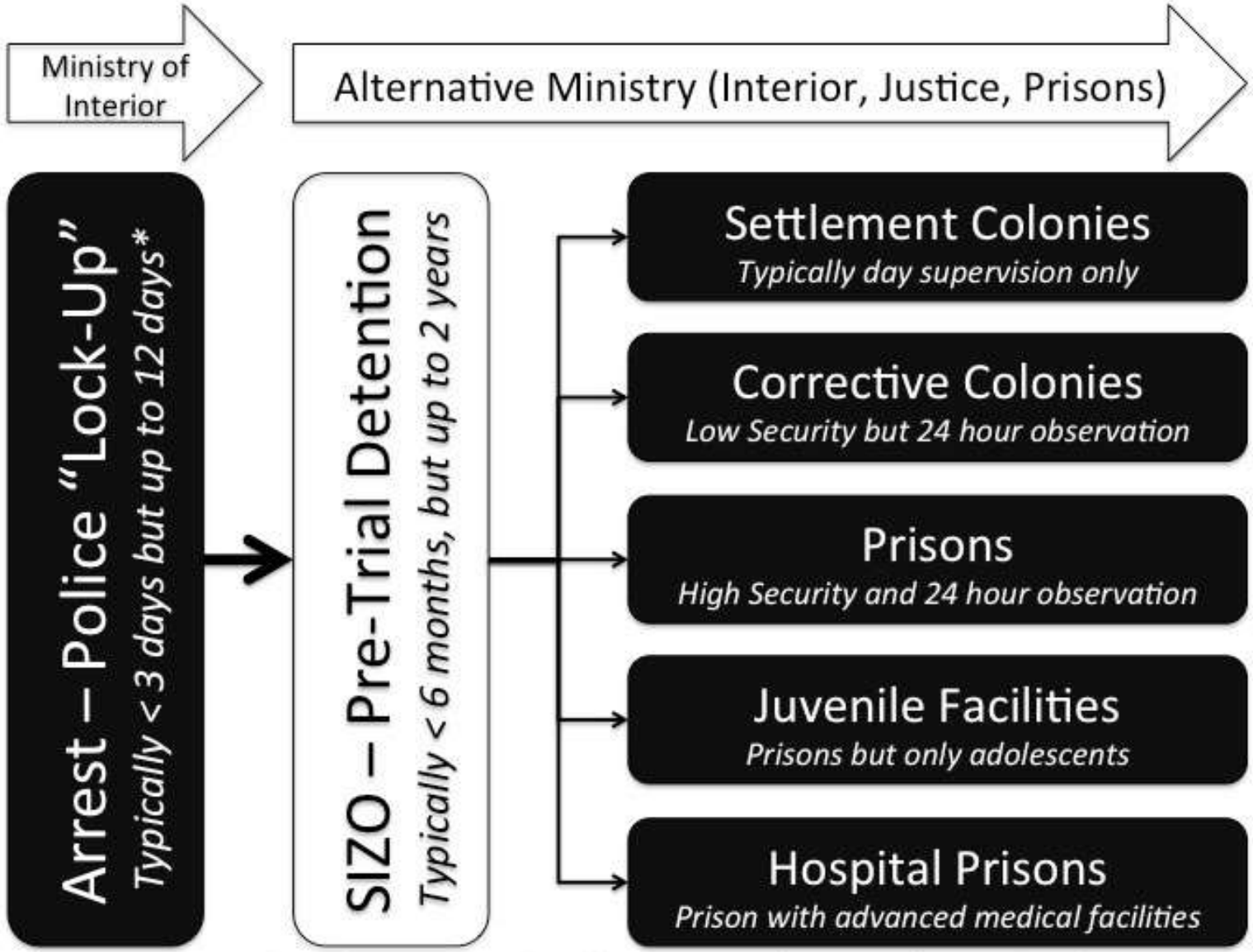


Figure 2: Relationship of the risk environment in community and criminal justice settings in Eastern Europe and Central Asia

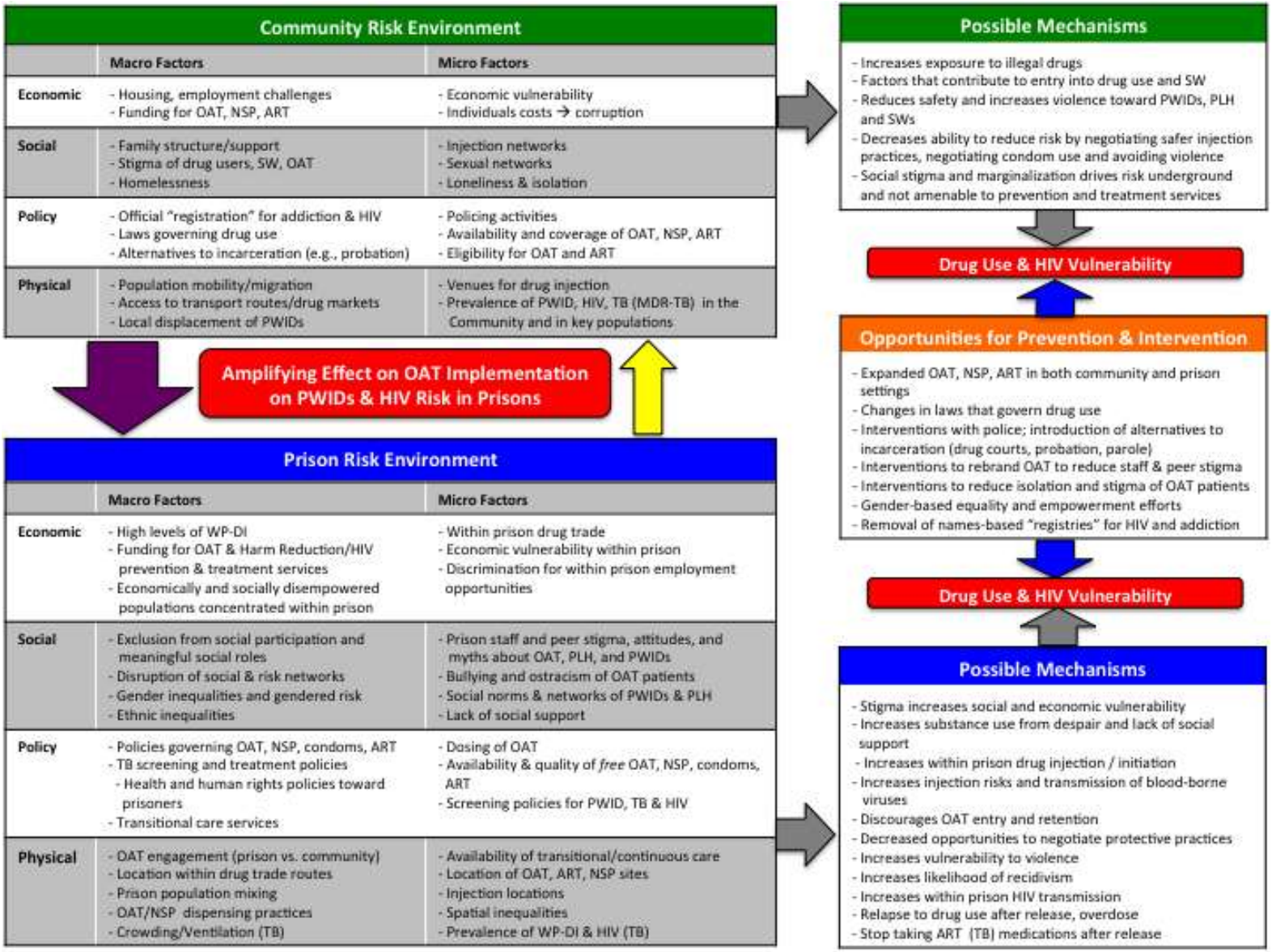
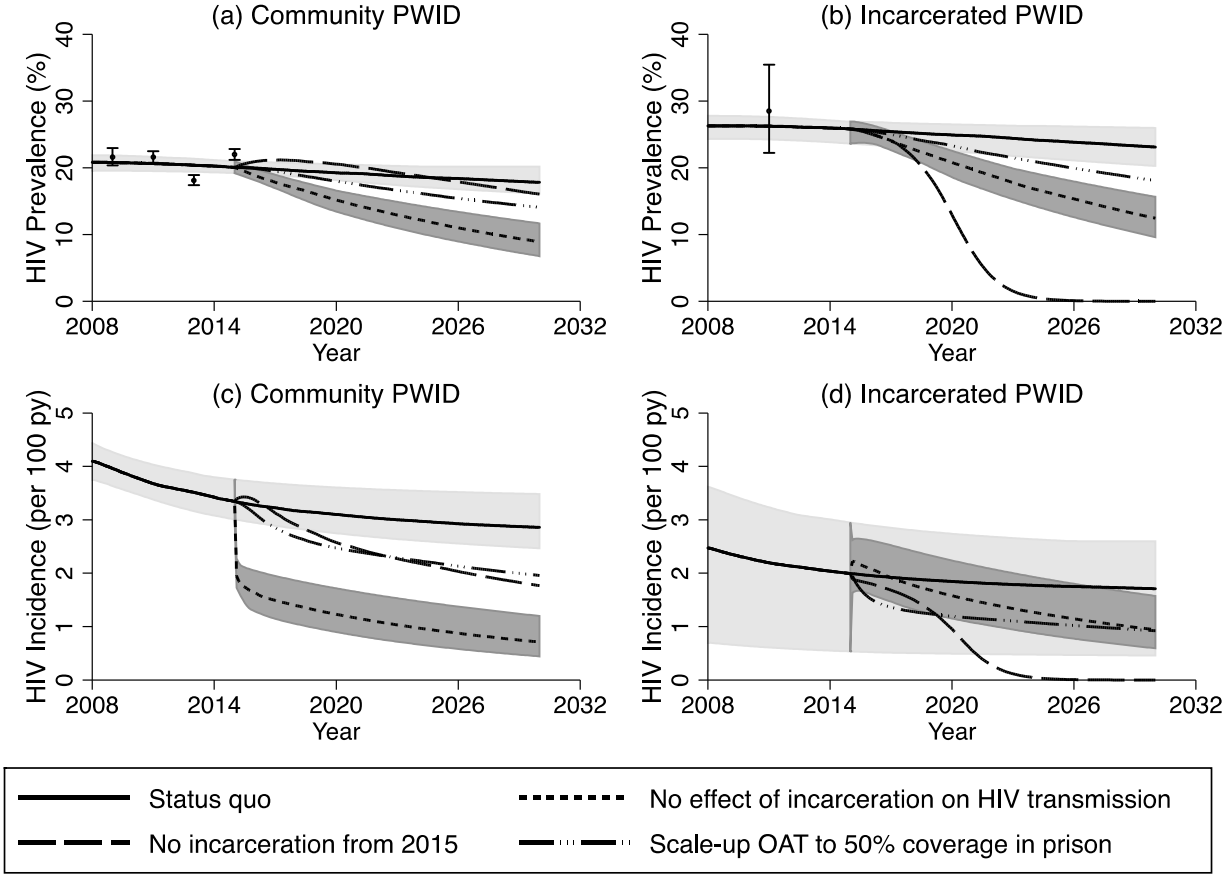
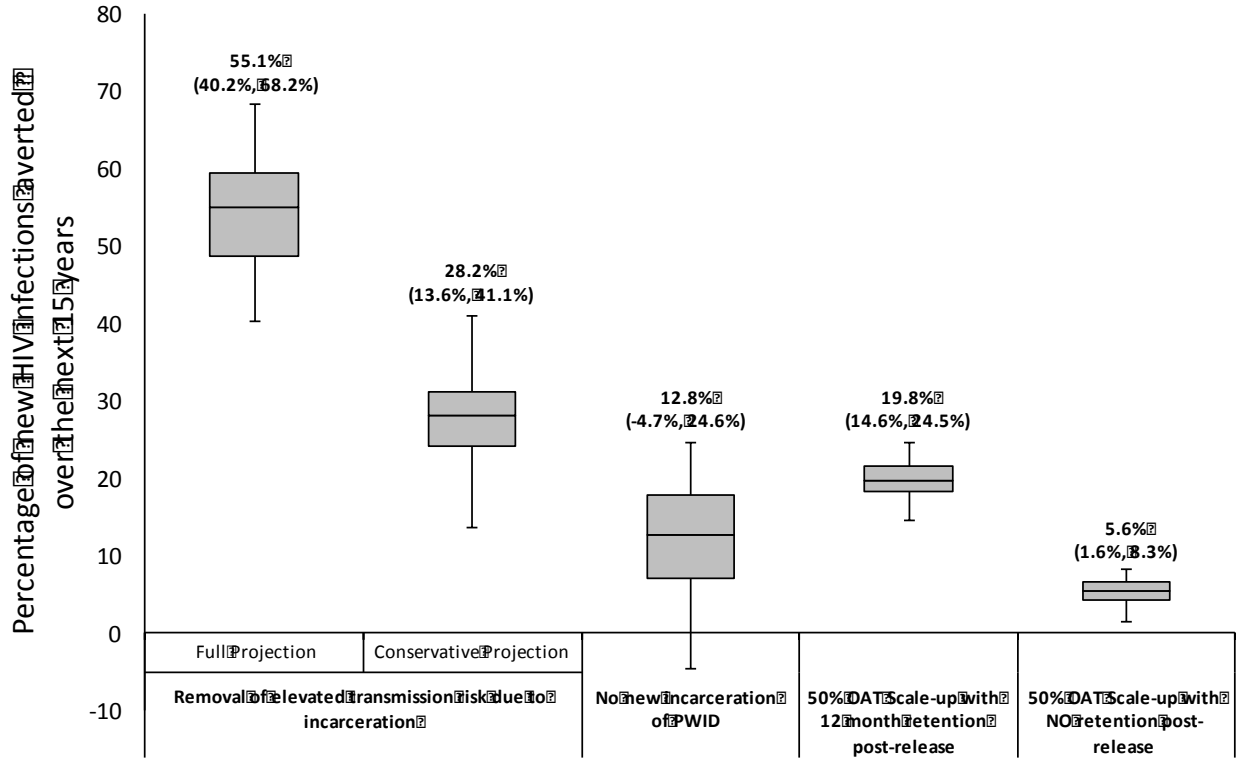


Figure 3: Projected median trends in HIV prevalence (a,b) and incidence (c,d) among community (both never and previously incarcerated PWID) and incarcerated PWID in Ukraine for various incarceration and intervention scenarios*



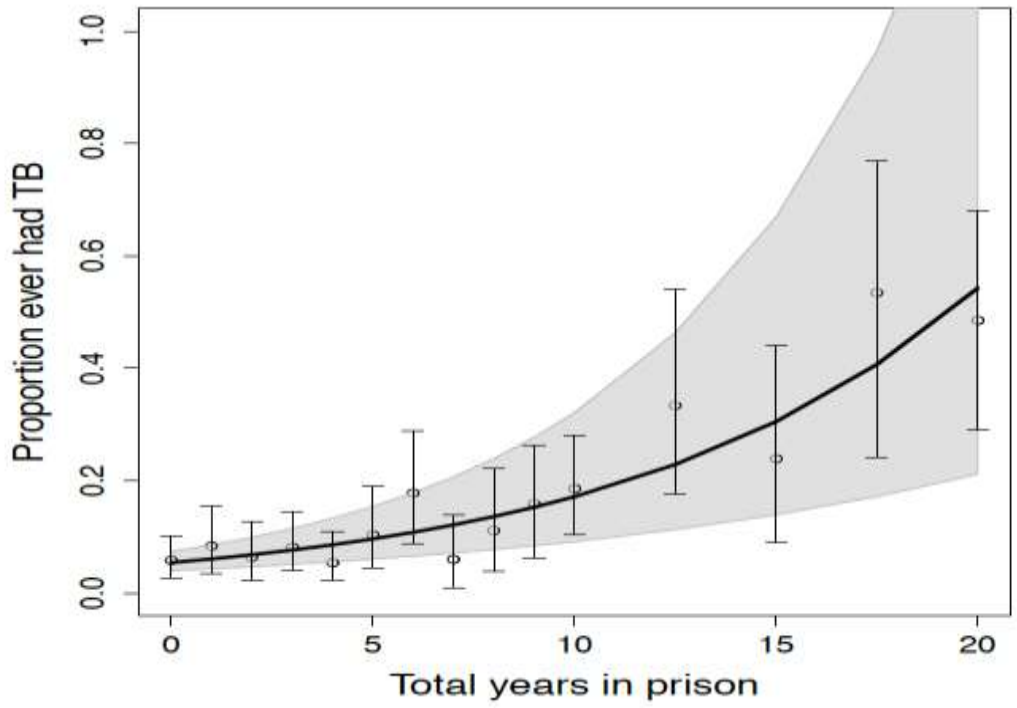
* Scenarios shown are for the status quo (solid black line), and if there was either: no effect of incarceration on transmission risk after 2015 (short dashed line); no further incarceration of PWID after 2015 (long dashed line); or 50% of incarcerated PWID were initiated on OAT each year starting from 2015 and maintained on OAT for a year after release (long dash-dot line). Data points with 95%CI are shown for comparison and shading represents the 95% credibility intervals for the status quo projection (light shading) and if incarceration had no effect on transmission risk after 2015 (dark shading).

Figure 4: Percentage of new HIV infections that would be averted over 15 years (from 2015 and 2030) if either (a) incarceration no longer elevated transmission risk (full and conservative projections); (b) there was no further new incarceration of PWID; or (c) prison OAT was scaled up with or without retention after release. Bars show the median projections, while error bars show the 95% credibility intervals.



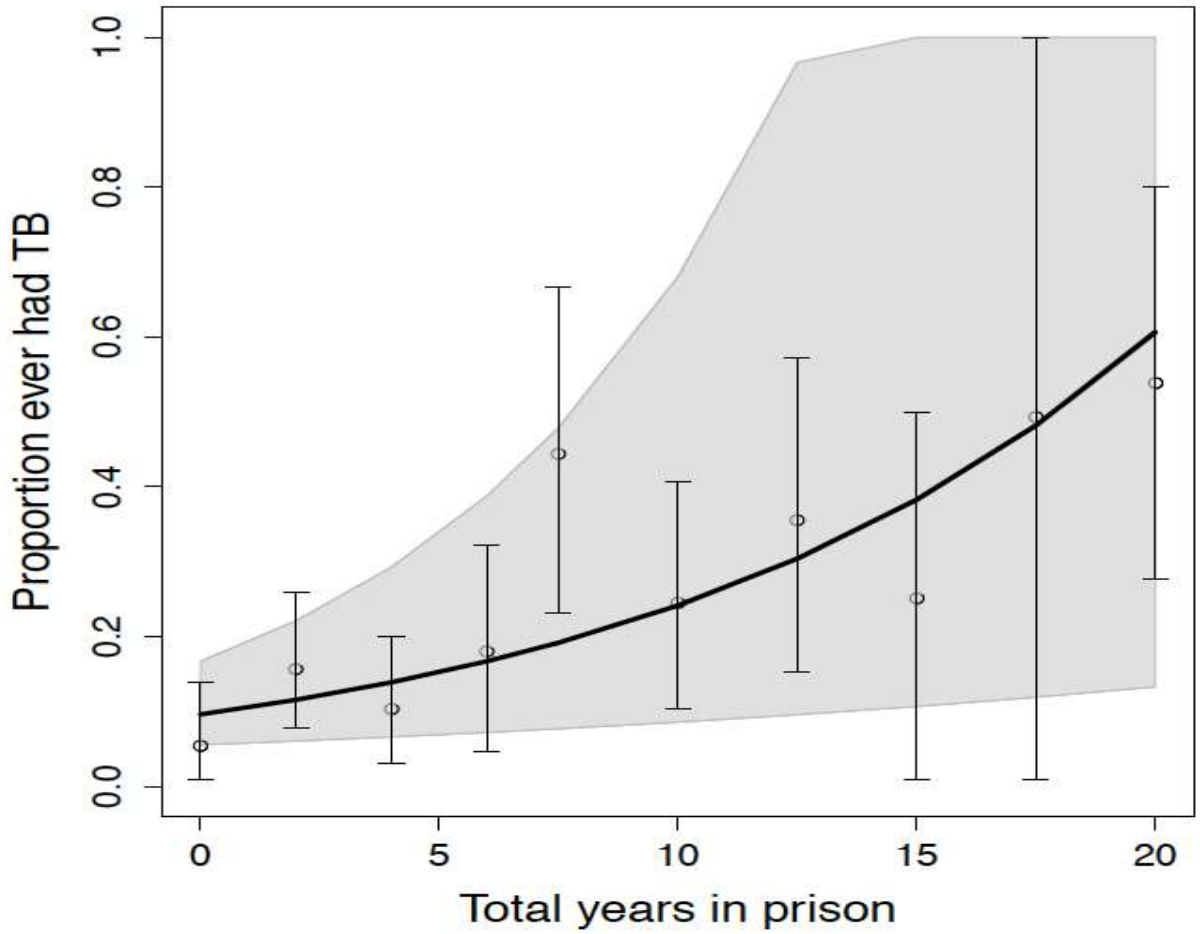
Figures 5: Association between number of years incarcerated and prevalence of ever having TB among prisoners (5A) and people who inject drugs in the community (5B) in Ukraine. The points are the mean proportion of prisoners (Figure 5A) or community PWID (Figure 5B) reporting ever having TB for different reported years in prison, and the error bars are the 95% bootstrapped confidence intervals about the mean. The solid black line is the best logistic fit to the data, and the grey shaded area is bounded by the best logistic fits to the lower and upper confidence bounds of the data.

5A. Prisoners in Ukraine



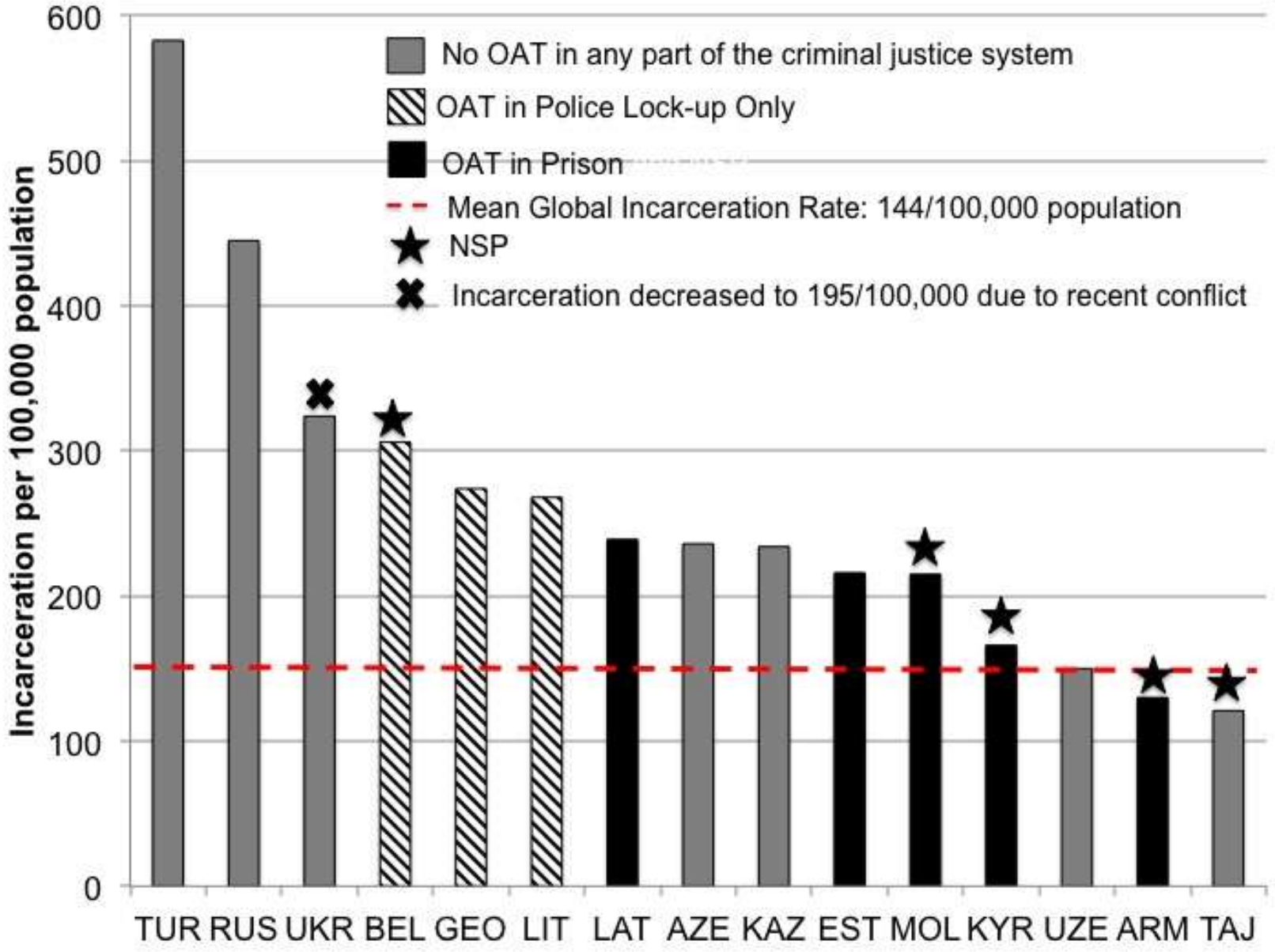
* Data derived from a 2011 PUHLSE national prison survey[39,45].

5B. Community People Who Inject Drugs in Ukraine



* Data derived from a multi-site ExMAT survey of people who inject drugs in Ukraine in 2015.

Figure 6: Incarceration Rates in Eastern European and Central Asian Countries and Availability of Opioid Agonist Therapies and Needle/Syringe Programs



References

1. Altice FL, Kamarulzaman A, Soriano VV, Schechter M, Friedland GH. Treatment of medical, psychiatric, and substance-use comorbidities in people infected with HIV who use drugs. *Lancet* 2010; **376**(9738): 367-87.
2. Singer M. Introduction to Syndemics: A Systems Approach to Public and Community Health. San Francisco, CA: Jossey-Bass; 2009.
3. Joint United Nations Programme on HIV/AIDS (UNAIDS). Global AIDS Update 2016. Geneva, Switzerland; 2016. p. Accessed on May 28, 2016 at: http://www.unaids.org/sites/default/files/media_asset/global-AIDS-update-_en.pdf.
4. World Health Organization (WHO). Global update on HIV treatment 2013: results, impact and opportunities. Geneva, Switzerland, 2013.
5. Degenhardt L, Mathers BM, Wirtz AL, et al. What has been achieved in HIV prevention, treatment and care for people who inject drugs, 2010-2012? A review of the six highest burden countries. *Int J Drug Policy* 2014; **25**(1): 53-60.
6. Wolfe D, Carrieri MP, Shepard D. Treatment and care for injecting drug users with HIV infection: a review of barriers and ways forward. *Lancet* 2010; **376**(9738): 355-66.
7. Awofeso N. Prisons as social determinants of hepatitis C virus and tuberculosis infections. *Public Health Rep* 2010; **125 Suppl 4**: 25-33.
8. Latypov A. Introduction: illicit drugs in Central Asia. *Int J Drug Policy* 2014; **25**(6): 1154.
9. Zabransky T, Mravcik V, Talu A, Jasaitis E. Post-Soviet Central Asia: a summary of the drug situation. *Int J Drug Policy* 2014; **25**(6): 1186-94.
10. Jolley E, Rhodes T, Platt L, et al. HIV among people who inject drugs in Central and Eastern Europe and Central Asia: a systematic review with implications for policy. *BMJ open* 2012; **2**(5).
11. Walmsley R. World Prison Population List (10th Edition). London, England: University of Essex, 2014.
12. Stuckler D, Basu S, McKee M, King L. Mass incarceration can explain population increases in TB and multidrug-resistant TB in European and central Asian countries. *Proc Natl Acad Sci U S A* 2008; **105**(36): 13280-5.
13. Stuckler D, King LP, Basu S. International Monetary Fund programs and tuberculosis outcomes in post-communist countries. *PLoS Med* 2008; **5**(7): e143.
14. Basu S, Stuckler D, McKee M. Addressing institutional amplifiers in the dynamics and control of tuberculosis epidemics. *Am J Trop Med Hyg* 2011; **84**(1): 30-7.
15. Rhodes T. The 'risk environment': a framework for understanding and reducing drug-related harm. *International J Drug Policy* 2002; **13**(2): 85-94.
16. Rhodes T, Singer M, Bourgois P, Friedman SR, Strathdee SA. The social structural production of HIV risk among injecting drug users. *Soc Sci Med* 2005; **61**(5): 1026-44.
17. Izenberg JM, Bachireddy C, Wickersham JA, et al. Within-prison drug injection among HIV-infected Ukrainian prisoners: prevalence and correlates of an extremely high-risk behaviour. *Int J Drug Policy* 2014; **25**(5): 845-52.

18. Dolan K, Moazen B, Noori A, Rahimzadeh S, Farzadfar F, Hariga F. People who inject drugs in prison: HIV prevalence, transmission and prevention. *Int J Drug Policy* 2015; **26 Suppl 1**: S12-5.
19. Culbert GJ, Waluyo A, Iriyanti M, Muchransyah AP, Kamarulzaman A, Altice FL. Within-prison drug injection among HIV-infected male prisoners in Indonesia: a highly constrained choice. *Drug Alcohol Depend* 2015; **149**: 71-9.
20. Culbert GJ, Earnshaw VA, Wulanyani NMS, Wegman MP, Waluyo A, Altice FL. Correlates and Experiences of HIV Stigma in Prisoners Living With HIV in Indonesia: A Mixed-Method Analysis. *J Assoc Nurses AIDS Care* 2015; **26**(6): 743-57.
21. Rhodes T. The 'risk environment': a framework for understanding and reducing drug-related harm. *The International journal on drug policy* 2002; **13**(2): 85-94.
22. United Nations Office on Drugs and Crime, World Health Organization Regional Office for Europe. Good governance for prison health in the 21st century. A policy brief on the organization of prison health. Copenhagen, 2013.
23. Elovich R, Drucker E. On drug treatment and social control: Russian narcology's great leap backwards. *Harm Reduct J* 2008; **5**: 23.
24. Rhodes T, Sarang A, Vickerman P, Hickman M. Policy resistance to harm reduction for drug users and potential effect of change. *BMJ* 2010; **341**: c3439.
25. Polonsky M, Azbel L, Wickersham JA, et al. Challenges to implementing opioid substitution therapy in Ukrainian prisons: Personnel attitudes toward addiction, treatment, and people with HIV/AIDS. *Drug Alcohol Depend* 2015; **148**: 47-55.
26. MacArthur GJ, Minozzi S, Martin N, et al. Opiate substitution treatment and HIV transmission in people who inject drugs: systematic review and meta-analysis. *BMJ* 2012; **345**: e5945.
27. Kim SW, Pulkki-Brannstrom AM, Skordis-Worrall J. Comparing the cost effectiveness of harm reduction strategies: a case study of the Ukraine. *Cost effectiveness and resource allocation : C/E* 2014; **12**: 25.
28. Meyer JP, Qiu J, Chen NE, Larkin GL, Altice FL. Emergency department use by released prisoners with HIV: an observational longitudinal study. *PLoS One* 2012; **7**(8): e42416.
29. Schluger NW, El-Bassel N, Hermosilla S, et al. Tuberculosis, drug use and HIV infection in Central Asia: an urgent need for attention. *Drug Alcohol Depend* 2013; **132 Suppl 1**: S32-6.
30. Walsh N, Maher L. HIV and HCV among people who inject drugs in Central Asia. *Drug Alcohol Depend* 2013; **132 Suppl 1**: S37-40.
31. Kazatchkine M. Drug use, HIV, HCV and TB: major interlinked challenges in Eastern Europe and Central Asia. *J Int AIDS Soc* 2014; **17**(4 Suppl 3): 19501.
32. Pokrovskiy V. HIV epidemic in Russia and neighbouring countries. *J Int AIDS Soc* 2014; **17**(4 Suppl 3): 19502.
33. Pridemore W. Criminological Transition? Change and stability in homicide characteristics during rapid social change. *Br J Criminol* 2007; **47**: 331-45.
34. World Health Organization (WHO). HIV in Prisons. 2015. Accessed on August 7, 2015 at http://www.euro.who.int/en/health-topics/communicable-diseases/hivaids/policy/policy-guidance-for-key-populations-most-at-risk2/hiv-in-prisons.

35. Larney S, Kopinski H, Beckwith CG, et al. Incidence and prevalence of hepatitis C in prisons and other closed settings: results of a systematic review and meta-analysis. *Hepatology* 2013; **58**(4): 1215-24.
36. Latypov A, Grund JP, El-Bassel N, Platt L, Stover H, Strathdee S. Illicit drugs in Central Asia: what we know, what we don't know, and what we need to know. *Int J Drug Policy* 2014; **25**(6): 1155-62.
37. Izenberg JM, Bachireddy C, Soule M, Kiriazova T, Dvoryak S, Altice FL. High rates of police detention among recently released HIV-infected prisoners in Ukraine: Implications for health outcomes. *Drug Alcohol Depend* 2013; **133**(1): 154-60.
38. Mimiaga MJ, Safren SA, Dvoryak S, Reisner SL, Needle R, Woody G. "We fear the police, and the police fear us": structural and individual barriers and facilitators to HIV medication adherence among injection drug users in Kiev, Ukraine. *AIDS Care* 2010; **22**(11): 1305-13.
39. Azbel L, Wickersham JA, Grishaev Y, Dvoryak S, Altice FL. Burden of infectious diseases, substance use disorders, and mental illness among Ukrainian prisoners transitioning to the community. *PLoS One* 2013; **8**(3): e59643.
40. Azbel L, Wickersham JA, Wegman MP, et al. Burden of substance use disorders, mental illness, and correlates of infectious diseases among soon-to-be released prisoners in Azerbaijan. *Drug Alcohol Depend* 2015; **151**: 68-75.
41. Azbel L, Polonsky M, Wegman M, et al. Intersecting epidemics of HIV, HCV, and syphilis among soon-to-be released prisoners in Kyrgyzstan. *International J Drug Policy* 2016: In Press.
42. Vagenas P, Azbel L, Polonsky M, et al. A review of medical and substance use co-morbidities in Central Asian prisons: Implications for HIV prevention and treatment. *Drug Alcohol Depend* 2013; **132**(Suppl 1): S25-31.
43. Joint United Nations Programme on HIV/AIDS (UNAIDS). The Gap Report. Geneva, Switzerland; 2014. p. Accessed on 24 August 2014 at: http://www.unaids.org/en/media/unaids/contentassets/documents/unaidspublication//unaids_gap_report_en.pdf.
44. UNAIDS. Global Report: UNAIDS report on the global AIDS epidemic 2013. Geneva, Switzerland: Joint United Nations Programme on HIV/AIDS (UNAIDS),, 2013.
45. Azbel L, Wickersham JA, Grishaev Y, Dvoryak S, Altice FL. Correlates of HIV infection and being unaware of HIV status among soon-to-be-released Ukrainian prisoners. *J Int AIDS Soc* 2014; **17**(1): 19005.
46. Stöver H. Drug Treatment Systems in Prisons Study in 10 Eastern European prisons 2015.
47. Jurgens R, Ball A, Verster A. Interventions to reduce HIV transmission related to injecting drug use in prison. *Lancet Infect Dis* 2009; **9**(1): 57-66.
48. Kinner SA, Jenkinson R, Gouillou M, Milloy MJ. High-risk drug-use practices among a large sample of Australian prisoners. *Drug Alcohol Depend* 2012; **126**(1-2): 156-60.
49. Caplinskiene I, Caplinskas S, Griskevicius A. [Narcotic abuse and HIV infection in prisons]. *Medicina (Kaunas)* 2003; **39**(8): 797-803.

50. Lucas GM, Solomon SS, Srikrishnan AK, et al. High HIV burden among people who inject drugs in 15 Indian cities. *AIDS* 2015; **29**(5): 619-28.
51. Milloy MJ, Montaner JS, Wood E. Incarceration of people living with HIV/AIDS: implications for treatment-as-prevention. *Curr HIV/AIDS Rep* 2014; **11**(3): 308-16.
52. McNairy ML, Deryabina A, Hoos D, El-Sadr WM. Antiretroviral therapy for prevention of HIV transmission: potential role for people who inject drugs in Central Asia. *Drug Alcohol Depend* 2013; **132 Suppl 1**: S65-70.
53. Joint United Nations Programme on HIV/AIDS. 90-90-90- An ambitious treatment target to help end the AIDS epidemic. New York; 2014. p. Accessed on March 12, 2015 at http://www.unaids.org/en/resources/documents/4/90-90-90
54. DeHovitz J, Uuskula A, El-Bassel N. The HIV epidemic in Eastern Europe and Central Asia. *Curr HIV/AIDS Rep* 2014; **11**(2): 168-76.
55. Iroh PA, Mayo H, Nijhawan AE. The HIV Care Cascade Before, During, and After Incarceration: A Systematic Review and Data Synthesis. *Am J Public Health* 2015; **105**(7): e5-16.
56. Meyer JP, Zelenev A, Wickersham JA, Williams CT, Teixeira PA, Altice FL. Gender disparities in HIV treatment outcomes following release from jail: results from a multicenter study. *Am J Public Health* 2014; **104**(3): 434-41.
57. Meyer JP, Cepeda J, Taxman FS, Altice FL. Sex-Related Disparities in Criminal Justice and HIV Treatment Outcomes: A Retrospective Cohort Study of HIV-Infected Inmates. *Am J Public Health* 2015; **105**(9): 1901-10.
58. Zampino R, Coppola N, Sagnelli C, Di Caprio G, Sagnelli E. Hepatitis C virus infection and prisoners: Epidemiology, outcome and treatment. *World J Hepatology* 2015; **7**(21): 2323-30.
59. Lin W, Weinberg EM, Chung RT. Pathogenesis of accelerated fibrosis in HIV/HCV co-infection. *J Infect Dis* 2013; **207 Suppl 1**: S13-8.
60. Bednasz CJ, Sawyer JR, Martinez A, et al. Recent advances in management of the HIV/HCV coinfected patient. *Future virology* 2015; **10**(8): 981-97.
61. Mitruka K, Tsertsvadze T, Butsashvili M, et al. Launch of a Nationwide Hepatitis C Elimination Program - Georgia, April 2015. *MMWR Morbidity and mortality weekly report* 2015; **64**(28): 753-7.
62. Gelmanova IY, Ahmad Khan F, Becerra MC, et al. Low rates of recurrence after successful treatment of multidrug-resistant tuberculosis in Tomsk, Russia. *Int J Tuberc Lung Dis* 2015; **19**(4): 399-405.
63. Gelmanova IY, Keshavjee S, Golubchikova VT, et al. Barriers to successful tuberculosis treatment in Tomsk, Russian Federation: non-adherence, default and the acquisition of multidrug resistance. *Bull World Health Organ* 2007; **85**(9): 703-11.
64. Müller-Nordhorn J, Holmberg C, Dokova KG, et al. Perceived challenges to public health in Central and Eastern Europe: a qualitative analysis. *BMC Public Health* 2012; **12**: 311.
65. Acosta CD, Dadu A, Ramsay A, Dara M. Drug-resistant tuberculosis in Eastern Europe: challenges and ways forward. *Public Health Action* 2014; **4**(Suppl 2): S3-s12.

66. Lange C, Abubakar I, Alffenaar JWC, et al. Management of patients with multidrug-resistant/extensively drug-resistant tuberculosis in Europe: a TBNET consensus statement. *Eur Respir J* 2014; **44**(1): 23-63.
67. Efsen AMW, Schultze A, Post FA, et al. Major Challenges in Clinical Management of TB/HIV Coinfected Patients in Eastern Europe Compared with Western Europe and Latin America. *PLoS One* 2015; **10**(12): e0145380.
68. Migliori GB, Dara M, de Colombani P, Kluge H, Raviglione MC. Multidrug-resistant tuberculosis in Eastern Europe: still on the increase? *Eur Respir J* 2012; **39**(6): 1290-1.
69. Skrahina A, Hurevich H, Zalutskaya A, et al. Alarming levels of drug-resistant tuberculosis in Belarus: results of a survey in Minsk. *Eur Respir J* 2012; **39**(6): 1425-31.
70. World Health Organization (WHO). Global Tuberculosis Report 2013 Geneva, Switzerland; 2013. p. Accessed on December 13, 2013 at: http://apps.who.int/iris/bitstream/10665/91355/1/9789241564656_eng.pdf.
71. World Health Organization (WHO). Prisons and Health. Copenhagen, Denmark: Regional Office of Europe, 2014.
72. Dara M, Chadha SS, Vinkeles Melchers NV, et al. Time to act to prevent and control tuberculosis among inmates. *Int J Tuberc Lung Dis* 2013; **17**(1): 4-5.
73. Abubakar I, Dara M, Manissero D, Zumla A. Tackling the spread of drug-resistant tuberculosis in Europe. *Lancet* 2012; **379**(9813): e21-3.
74. El-Bassel N, Shaw SA, Dasgupta A, Strathdee SA. Drug use as a driver of HIV risks: re-emerging and emerging issues. *Curr Opin HIV AIDS* 2014; **9**(2): 150-5.
75. Arinaminpathy N, Dye C. Health in financial crises: economic recession and tuberculosis in Central and Eastern Europe. *Journal of the Royal Society Interface* 2010; **7**(52): 1559-69.
76. Skrahina A, Hurevich H, Zalutskaya A, et al. Multidrug-resistant tuberculosis in Belarus: the size of the problem and associated risk factors. *Bull World Health Organ* 2013; **91**(1): 36-45.
77. Ministry of Health of the Russian Federation. Tuberculosis in the Russian Federation, 2009. An analytical review of the TB statistical indicators used in the Russian Federation. . Moscow: Ministry of Health of the Russian Federation,; 2009. p. Accessed on September 16, 2015 at: http://www.mednet.ru/images/stories/files/static/VOZ_tub_09_eng.pdf.
78. World Health Organization (WHO). Towards universal access to diagnosis and treatment of multidrug-resistant and extensively drug-resistant tuberculosis by 2015 In: WHO/HTM/TB, editor. Geneva: World Health Organization; 2015. p. Accessed on September 9, 2015 at: Available from: http://whqlibdoc.who.int/publications/1/9789241501330_eng.pdf
79. Dubrovina I, Miskinis K, Lyepshina S, et al. Drug-resistant tuberculosis and HIV in Ukraine: a threatening convergence of two epidemics? *Int J Tuberc Lung Dis* 2008; **12**(7): 756-62.
80. Dara M, Grzemska M, Kimerling ME, Reyes H, Zagorskiy. Guidelines for Control of Tuberculosis in Prisons: Tuberculosis Coalition for Technical Assistance and International Committee of the Red Cross, 2009.

81. World Health Organization (WHO). Azerbaijan brings quality tuberculosis care to prisons. 2015. http://www.who.int/features/2015/azerbaijan-tb/en/ (accessed September 9, 2015.
82. International HIV/AIDS Alliance in Ukraine. Integrated Behavioral and Biological Assessment 2015 - National survey of PWID. Kiev, Ukraine; 2015.
83. International HIV/AIDS Alliance of Ukraine. Integrated Behavioral and Biological Assessment 2011 - National survey of PWID (n=9069) in 26 cities 2011. http://www.aidsalliance.org.ua/ru/library/our/2012/me/idu_en_2011.pdf (accessed 14 Sep 2015.
84. Grau LE, White E, Niccolai LM, et al. HIV disclosure, condom use, and awareness of HIV infection among HIV-positive, heterosexual drug injectors in St. Petersburg, Russian Federation. *AIDS Behav* 2011; **15**(1): 45-57.
85. Li L, Assanangkornchai S, Duo L, McNeil E, Li J. Risk behaviors, prevalence of HIV and hepatitis C virus infection and population size of current injection drug users in a China-Myanmar border city: results from a Respondent-Driven Sampling Survey in 2012. *PLoS One* 2014; **9**(9): e106899.
86. Allen EJ, Palmateer NE, Hutchinson SJ, Cameron S, Goldberg DJ, Taylor A. Association between harm reduction intervention uptake and recent hepatitis C infection among people who inject drugs attending sites that provide sterile injecting equipment in Scotland. *Int J Drug Policy* 2012; **23**(5): 346-52.
87. Cepeda JA, Niccolai LM, Lyubimova A, Kershaw T, Levina O, Heimer R. High-risk behaviors after release from incarceration among people who inject drugs in St. Petersburg, Russia. *Drug Alcohol Depend* 2015; **147**: 196-202.
88. Milloy MJS, Buxton J, Wood E, Li K, Montaner JSG, Kerr T. Elevated HIV risk behaviour among recently incarcerated injection drug users in a Canadian setting: a longitudinal analysis. *BMC public health* 2009; **9**: 156-.
89. International HIV/AIDS Alliance of Ukraine. Integrated Behavioral and Biological Assessment 2013 - National survey of PWID (n=9502) in 29 cities 2013. http://www.aidsalliance.org.ua/ru/library/our/2014/arep14/zvit IDU_obl_eng.pdf (accessed 14 Sep 2015.
90. Booth RE, Kwiatkowski CF, Brewster JT, Sinitsyna L, Dvoryak S. Predictors of HIV sero-status among drug injectors at three Ukraine sites. *AIDS* 2006; **20**(17): 2217-23.
91. Makarenko J, Mazhnaya A, Polonsky M, et al. Determinants of Willingness to Enroll in Opioid Agonist Treatment among Opioid Dependent People Who Inject Drugs in Ukraine. *Drug Alcohol Depend* 2016: In press.
92. Rhodes T, Simic M. Transition and the HIV risk environment. *BMJ* 2005; **331**(7510): 220-3.
93. Baussano I, Williams BG, Nunn P, Beggiato M, Fedeli U, Scano F. Tuberculosis Incidence in Prisons: A Systematic Review. *PLoS Med* 2010; **7**(12): e1000381.
94. Maru DS, Basu S, Altice FL. HIV control efforts should directly address incarceration. *Lancet Infect Dis* 2007; **7**(9): 568-9.
95. Baral S, Todd CS, Aumakhan B, Lloyd J, Delegchoimbol A, Sabin K. HIV among female sex workers in the Central Asian Republics, Afghanistan, and Mongolia: contexts and convergence with drug use. *Drug Alcohol Depend* 2013; **132 Suppl 1**: S13-6.

96. Ancker S, Rechel B. Policy responses to HIV/AIDS in Central Asia. *Glob Public Health* 2015; **10**(7): 817-33.
97. Izenberg J, Altice FL. Next Steps for Ukraine - Abolition of HIV Registries, Implementation of Routine HIV Testing and Expansion of Services. *Addiction* 2010; **105**(3): 569-70.
98. Bojko MJ, Mazhnaya A, Makarenko I, et al. "Bureaucracy & Beliefs": Assessing the barriers to accessing opioid substitution therapy by people who inject drugs in Ukraine. *Drugs: Education, Prevention and Policy* 2015; **22**(3): 255-62.
99. Scutelniciuc O, Bivol S, Plamadeala D, Slobozian V. Behavioral surveillance survey among IDUs who are beneficiaries of harm reduction programs. In: Moldova Ministry of Health, editor.: European Monitoring Centre for Drugs and Drug Addiction (EMCDDA),; 2009. p. Accessed on September 7, 2015 at: http://www.emcdda.europa.eu/publications/country-overviews/md.
100. Mazhnaya A, Bojko MJ, Marcus R, et al. In Their Own Voices: Breaking the Vicious Cycle of Addiction Treatment and Criminal Justice Among People Who Inject Drugs in Ukraine. *Drugs: Education, Prevention and Policy* 2016: In Press.
101. Spicer N, Harmer A, Aleshkina J, et al. Circus monkeys or change agents? Civil society advocacy for HIV/AIDS in adverse policy environments. *Soc Sci Med* 2011; **73**(12): 1748-55.
102. Booth RE, Dvoryak S, Sung-Joon M, et al. Law enforcement practices associated with HIV infection among injection drug users in Odessa, Ukraine. *AIDS Behav* 2013; **17**(8): 2604-14.
103. Lunze K, Raj A, Cheng DM, et al. Punitive policing and associated substance use risks among HIV-positive people in Russia who inject drugs. *J Int AIDS Soc* 2014; **17**: 19043.
104. Polonsky M, Rozanova J, Azbel L, et al. Attitudes Toward Addiction, Methadone Treatment, and Recovery Among HIV-Infected Ukrainian Prisoners Who Inject Drugs: Incarceration Effects and Exploration of Mediators. *AIDS Behav* 2016: In Press.
105. Polonsky M, Azbel L, Wickersham JA, et al. Accessing methadone within Moldovan prisons: Prejudice and myths amplified by peers. *Int J Drug Policy* 2016; **29**: 91-5.
106. Kivimets K, Uuskula A. HIV testing and counselling in Estonian prisons, 2012 to 2013: aims, processes and impacts. *Euro Surveill* 2014; **19**(47): 20970.
107. Bojko MJ, Dvoriak S, Altice FL. At the crossroads: HIV prevention and treatment for people who inject drugs in Ukraine. *Addiction* 2013; **108**(10): 1697-9.
108. Cakalo JI, Bozicevic I, Vitek C, Mandel JS, Salyuk T, Rutherford GW. Misclassification of Men with Reported HIV Infection in Ukraine. *AIDS Behav* 2015.
109. United Nations. 45/111. Basic Principles for the Treatment of Prisoners. 1990 (accessed March 12, 2010 at: http://www.un.org/documents/ga/res/45/a45r111.htm 2010).
110. Bretschneider W, Elger BS. Expert perspectives on Western European prison health services: do ageing prisoners receive equivalent care? *J Bioeth Inq* 2014; **11**(3): 319-32.